VOL. 9

ADAPTIVE RESEARCH REPORTS

RAPPORTS DE RECHERCHES SUR L'ADAPTATION

1987

Plant Industry Branch
Direction de l'industrie végétale

New Brunswick Department of Agriculture
Ministère de l'agriculture du Nouveau-Brunswick

VOL. 9

1987 ADAPTIVE RESEARCH REPORTS

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PLANT INDUSTRY BRANCH
DIRECTION DE L'INDUSTRIE VÉGÉTALE
New Brunswick Department of Agriculture
Ministère de l'agriculture du Nouveau-Brunswick

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INTRODUCTION

The evaluation and development of new crops, varieties, products and technologies are essential to improving our agricultural production. In this ninth edition of the Adaptive Research Report, Plant Industry Branch publishes the results of a number of projects conducted by staff members. These reports are provided to inform producers and agrologists of recent developments and findings in the area of Field Crop, Horticulture, Land Resource and Plant Health. Producers requiring further information on any project should contact the author(s) directly.

I would like to thank all producers and organizations that co-operated in the projects. The efforts of staff members are also recognized.

The editor David Finnamore, assisted by Serge Michaud are given special acknowledgement for making the report a reality.

The cost-shared, Canada-New Brunswick Agri-Food Development Subsidiary Agreement is recognized for its financial support to many of the papers.

Acknowlegement is made to the Word Processing Centre for typing the papers, to Information Services for printing and binding the publication and to the Translation Bureau for translating the abstracts.

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L'évaluation et la mise au point de nouveaux produits, cultures, variétés et technologies sont essentielles pour l'amélioration de notre production agricole. Par cette neuvième publication des rapports de recherches, la Direction de l'industrie végétale publie les résultats d'un certain nombre de projets dirigés par son personnel. Ces rapports veulent informer les producteurs et les agronomes des récentes innovations et consultations dans les secteurs des grandes cultures, de l'horticulture, des ressources en sols et de la santé des végétaux. Les producteurs qui veulent obtenir de plus amples renseignements sur un projet particulier devraient communiquer directement avec les auteurs.

Qu'il nous soit permis de remercier tous les producteurs et les organismes qui ont collaboré aux projets. Les efforts des membres du personnel sont aussi appréciés.

Un merci spécial au chargé de publication, M. David Finnamore, aidé de M. Serge Michaud, pour la publication des rapports.

Nous devons également reconnaître le support financier que l'entente auxiliaire Canada-Nouveau-Brunswick sur le développement du secteur agro-alimentaire à contribué à plusieurs de ces projets.

Tous nos remerciements également au Centre de traitement des textes pour avoir dactylographié les documents, à la Section de l'information pour les avoir imprimés et reliés et au Bureau de traduction, pour avoir traduits les résumés.

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MOUSE GUARDS FOR APPLE TREES

R. Tremblay, G. W. Reed, J.Coburn, U. Williams

***Abstract**: After three years of mouse guard evaluation on young trees at two sites in N.B., mouse damage was found on three of the eight types of mouse guards. They are: White Plastic Wrapper, white Plastic Mesh and Arborgard. The wire mesh caused bark injury by friction. (The top edge should be rolled toward the outside). At both sites, the aluminium reflective vapour barrier had to be replaced with a modified version in order to increase it's longevity. The more satisfactory guards were; Black Drainage Tile, Lore-gard and Black Plastic Mesh.*

PROTECTION DES POMMIERS CONTRE LES SOURIS

***Résumé** : Après trois ans d'évaluation des différents types de protecteurs de pommiers installés sur de jeunes arbres à deux endroits au Nouveau-Brunswick, on a constaté que trois des huit types de protecteurs mis à l'essai n'étaient pas efficaces. Il s'agit du papier plastique blanc, du grillage de plastique blanc et du dispositif Arborgard. Le grillage métallique a provoqué des meurtrissures sur les arbres, attribuables à un phénomène de friction (le rebord supérieur doit être roulé vers l'extérieur.) Aux deux endroits, le coupe-vapeur réfléchissant en aluminium a dû être remplacé par une version modifiée afin d'accroître sa durabilité. Les protecteurs ayant donné les résultats les plus satisfaisants sont les tuyaux de céramique noirs, le Lore-gard et le grillage en plastique noir.*

INTRODUCTION: The purpose of this trial was to determine the type of mouse guard most effective against mice.

METHODS AND MATERIALS: Trials were set up in Keswick Ridge and St Antoine at John Coburns and Eddy Williams respectively. Both trials consisted of drainage tile, lore-gard, white plastic wrapper, black plastic mesh, aluminium reflective vapour barrier (alumi-guard) and wire mesh.

The trial at E. Williams has two additional types of mouse guards: white plastic mesh and arborgard. The set up of this trial consisted of 5 trees per treatment, randomly designed into 3 replications.

RESULTS: Keswick Ridge - There did not appear to be any mouse damage to the trees in this block. There was, however, some kind of damage to the base of a tree containing a lore-gard.
- Rubbing against the bark was primary caused by the wire mesh mouse guard although the majority of mouse guards did exhibit minimal rubbing.

- The alumi-guard had fair air circulation. However, there were a couple of slugs at the base of one of the trees. Note: The day of evaluation was sunny however the previous day it was rainy.

St. Antoine - Mouse damage occured on 3 trees in this block. The mouse guards involved were: white plastic wrapper, white plastic mesh and arborgard.
- The majority of the guards did exhibit some rubbing. However, the wire mesh guard showed the most extensive rubbing.

The base of the trees that contained alumi-guard showed no moisture retention. Note that evaluation did occur during a dry period.

At both trials, the aluminium reflective vapour barrier was replaced with a modified version in an attempt to increase the longetivity of the guard. The thickness of the guard was doubled. The guard was then put around the base of the tree and stapled to a small stake. The stake was used to provide support for the guard and to prevent it from folding.

CONCLUSION: The wire mesh is still a very popular mouse guard (friction can be reduced). The arborgard has to be painted or sprayed on every fall. The white plastic wrapper should not be used at all. The white plastic mesh (and also the black plastic mesh on other farms that these two being tested) has not shown any resistance to mouse damage through the mesh which resulted in mouse injury on the apple trees. The modified version of the alumi-guard will probably show some improvement in strength. The black drainage tile and lore-gard (even if you have to button it up once in a while) are giving good protection.

ACKNOWLEDGEMENTS: The authors wish to express their appreciation to Mr. John Coburn of Keswick Ridge, N.B. and Mr. Eddy Williams of St. Antoine, N.B. for their assistance and co-operation in making this project possible.

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ASSESSMENT OF PLUM AND CHERRY CULTIVARS

R. Tremblay, E.N. Estabrooks and G.W. Reed

Abstract: *A planting of promising plum and cherry cultivars was made in the Provincial Orchard in Fredericton in 1983 and also cherry cultivars were planted at the Ferme Bourgeois in Pré d'En-Haut, N.B.. Cherries and plums were harvested in 1987.*

ÉVALUATION DE CULTIVARS DE PRUNIERS ET DE CERISIERS

Résumé: *Des cultivars prometteurs de pruniers et de cerisiers ont été plantés dans le verger provincial de Fredericton en 1983. Des cultivars de cerisiers ont été plantés à la même époque à la Ferme Bourgeois de Pré d'En-Haut, au Nouveau-Brunswick. Une récolte de cerises et de prunes a été faite en 1987.*

INTRODUCTION: During the past decade, a number of new plum and cherry cultivars have been introduced which are reported to have characteristics of improved hardiness, superior quality or increased productivity. It is our intention that these characteristics be evaluated in the coming years.

MATERIALS AND METHODS: Establishment and record of cultivar performance can be found in Adaptive Research Reports for 1984, 1985, 1986. The plum cultivars are: METHLEY; BURBANK; YELLOW EGG; CALIFORNIA BLUE; OZARK; VALOR; OTTAWA 3010 (VANIER); SUPERIOR; EARLY GOLDEN; STANLEY; MOUNT ROYAL and BLUE FREE. The cherry cultivars are: METEOR; NORTH STAR; STELLA; MONTMERENCY and WINDSOR.

RESULTS: See tables 1 & 2 for plum yields, & ave. weight per plum. See table 3 for cherry yields.

DISCUSSION: California Blue plums had a slight russeting. These plums began to fall on Aug. 18/87 (Approximately 10 were found on the ground).

Valour plums began dropping on Sept. 10/87.

Burbank had only 9 plums. Both Valour and Burbank had small yields.

Stanley plums were still hard and partly green when they were harvested on Sept. 4/87. By Sept. 24 the plums had fallen off the tree.

Blue Free plums were approximately 1/2 Green when they were harvested on Sept. 4/87. By Sept. 24/87, the plums on the tree were overripe and there was 100 approximately on the ground.

Cherries, Meteor on Mazzard at Farm Bourgeois (F.B.) produced higher yields than any other in the trial. This was probably due to two factors. One, the trees were larger in the F.B. Orchard two, a fine nylon net was used on all trees at the F.B. Orchard to protect the fruit from bird damage. None was used at the Fredericton Provincial Orchard (P.O.). In general cherries in the P.O. were harvested earlier than those at the F.B. Orchard.

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Tremblay R., E.N. Estabrooks, G.W. Reed, 1986. Assessment of Plum and Cherry Cultivars. Adaptive Research Reports. N.B.D.A. Vol. 8, 11.

Table 1 Total Harvest (kg) and Average Size (cm) of Plum Cultivars in 1987

Variety	Average Size (Length & Width)	Average Yield (Kg/Tree)
Blue Free	4.0 x 4.4	8.48
Mount Royal	3.4	2.81
Stanley	3.2 x 4.0	.85
California Blue	----	.48
Valour	4.0 x 4.7	.40
Burbank	3.6 x 4.5	.01

Table 2 Period of Harvesting and Average Wt. per Plum (g) in 1987

Variety	Harvest Start	Harvest Finish	Ave. Wt. Per Plum
Valour	2 Sept.	10 Sept.	40.5
Blue Free	4 Sept.	24 Sept.	37.5
Burbank	2 Sept.	2 Sept.	33.7
California Blue	14 Aug.	24 Aug.	31.5
Stanley	4 Sept.	24 Sept.	23.4
Mount Royal	27 Aug.	2 Sept.	22.2

Table 3 Fruit Yield of Cherry Cultivars in 1987 Average Yield (kg/tree)

Variety	P.O.	F.B.
Meteor	.45	6.48
Northstar	.79	1.64
Stella	.01	-----
Montmerency	.00	-----
Windsor	----	-----

P.O. - Provincial Orchard, Fredericton
F.B. - Ferme Bourgeois, Pré d'En-Haut

EVALUATION OF HALF-HIGH BLUEBERRY CLONES

Cynthia Murray and B.W. Dykeman

Abstract: *The evaluation of the Minnesota half-highbush bluebery clones was continued. Lack of vigorous plant growth and extensive infections of witches broom made it necessary to prune the trial severely in 1986. The plants responded well with yields ranging from 9-20 T/ha in 1987. Problems previously encountered: witches broom, canker and abscission zone tearing - are still underway.*

ÉVALUATION DE CLONES DE BLEUET SEMI-GÉANTS

Résumé *: L'évaluation des clones de bleuet semi-géants de type Minnesota s'est poursuivie. Vu l'absence d'une croissance vigoureuse des plants et l'infestation généralisée provoquée par le "balai de sorcière", il a été nécessaire de procéder à une taille prononcée des plants en 1986. Les plants ont très bien répondu à ce traitement avec des rendements allant de 9 à 20 tonnes l'hectare en 1987. Les problèmes précédemment éprouvés (le balai de sorcière, les chancres et la déchirure de la zone d'abscission) sont toujours présents.*

INTRODUCTION: In 1980, nine clonal selections from the Minnesota State University blueberry breeding program; one N.B. selection from a seedling line of Mn3; and Mel, a University of Maine selection were established for evaluation in New Brunswick. All of these clones originated from interspecific crosses of highbush, Vaccinium corymbosum and lowbush, V. angustifolium plants.

MATERIALS AND METHODS: The clones were placed in a randomized block design with four replications. Six plants per plot were used at a spacing of 1.0 m x 2.0 m. The trial was established at the N.B. Horticulture Centre on a riverbank loamy sand. Plants were mulched in the fall of the establishment year with 5 cm of sawdust.

The plots were fertilized each spring with 50 kg/ha of N, P_2O_5 and K_2O and irrigated throughout the season as required, except in 1987.

The trial was established on new land with low fertility and low soil organic matter. For this reason, growth and establishment was slow. lack of uniformity in the bushes and extensive witches broom infection led to the decision in spring 1986 to prune severely. The bushes were reduced to six inch stumps and left to recover.

Data of yield, fruit quality and plant growth were recorded from 1983-85, and again in 1987.

RESULTS AND DISCUSSION: Productivity: As in other years, there were significant differences between clones in their yield and fruit size (Table I). As in other years NBBCI has produced the largest crop. Unfortunately, its maturity is spread out and this may make it less desirable for commercial operations.

Fruit Quality: When the fruit was subjected to flavour evaluation, responses varied widely depending on personal preferences for sweet or tart/tangy berries. Clones such as Northblue, Northcountry, NBBCI were very flavorful with high acidity. Clones such as Northsky, Mn 84 and Mel were low in acid but very sweet.

The factor of pedicel separation at harvest was also noted. Unlike some lowbush blueberries, there was no problem with pedicels remaining attached to the fruit at harvest. However, a clean abscission layer between the pedicel and the fruit was not always present at harvest time. This resulted in a tearing of the fruit epidermis in the vicinity of the abscission scar. It is clear that maturity is a major factor in abscission zone tearing. What is less certain is whether some clones, even at optimum maturity, are more prone to this problem than others. This condition lowers the fresh market quality and storage life of the fruit.

Disease Management: Of the three major disease problems: witches broom, blueberry canker and mummy berry - only the witches broom remains evident, and even that appears to have been greatly reduced by the severe pruning of 1986. Appropriate fungicide sprays at the proper time will control the other two diseases, and research is underway on the control and/or management of witches broom.

CONCLUSION: This year produced very high yields from some clones. Fruit quality was generally very high, with the exception of abscission - zone tearing in some clones. This problem, along with witches broom and canker control, warrants further study.

Table I: Performance of Half-High Blueberry Clones in 1987

Clone	Yield (g/plot)	Yield (g/plant)	100 Berry Weight (g)	Projected Yield (Kg/ha)
Mn 84	11684	1947	167	9737
NBBC1	10671	2032	129	8893
Mn 354	9571	1595	143	7976
Mn 327	8922	1786	86	7435
Mn 61	8796	1466	86	7330
Northblue	8405	1684	201	7004
Mn 135	7425	1237	162	6787
Northsky	7044	1174	90	5870
Northcountry	5808	968	63	4840
Mn 330	5485	968	60	4571
Mel	4707	904	79	3923
LSD (.05)	4039	725	23	3366

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HIGHBUSH BLUEBERRY CLONE EVALUATION

Cynthia Murray and B.W. Dykeman

Abstract: *Six highbush blueberry cultivars and one half-high clone are being evaluated for hardiness and adaptability at the N.B. Horticultural Centre, Hoyt. To date, no significant differences have been found in the tissue and bud hardiness of the highbush and half-high cultivars. In the first harvest year, the half-high clone, NBBC1, outyielded the best highbush cultivar by 325%.*

ÉVALUATION DE CLONES DE BLEUET GÉANTS

Résumé : *Six cultivars de bleuet géants et un clone de bleuet semi-géant ont été évalués au Centre horticole de Hoyt du Nouveau-Brunswick afin d'établir leur rusticité et leur capacité d'adaptation. À ce jour, aucune différence significative n'a pu être décelée dans la rusticité des tissus et des bourgeons des cultivars géants et semi-géants. Au cours de la première année de récolte, le clone semi-géant NBBC1, a donné un rendement de 325 % supérieur au meilleur cultivar de bleuet géant.*

INTRODUCTION: Any perennial fruit crop to be grown in this area must exhibit a high degree of winter-hardiness. Using this criteria, six highbush blueberry (Vaccinium corymbosum) cultivars were selected for a cold-hardiness trial, along with one half-high clone (V. corymbosum x angustifolium) of known cold-hardiness and high production capability.

Differential Thermal Analysis (DTA) was performed on bud and stem tissue for two years (1985-86, 1986-87) throughout the winter months.

Since the plants were gathered from different sources, they varied in size and age. To make the planting more uniform, all plants were pruned to remove all flowerbuds in 1986. The first harvest data was gathered in 1987.

MATERIALS AND METHODS: The seven cultivars were planted in a RCBD, with six plants per replication and four replications. Spacing was 1 m x 2 m.

The plants are fertilized with 50 kg/ha N, P_2O_5, K_2O in the spring, and irrigated as necessary.

RESULTS: As expected for the first year, harvest yields were not spectacular (see Table 1) except in the case of NBBC1. The clones vary in maturity dates from early for Northland, Spartan, Bluecrop, Patriot and Blueray to very late for Burlington. NBBC1 has an extended period of harvest from early to late. In all, six harvests were made from July 29 to September 23. This could probably be shortened somewhat to three or four harvests, as the bushes mature.

No infections by canker (Godronia cassandrae) have been noted to date. Some witches broom was pruned out in October, 1987.

Table 1. Performance of Highbush Blueberry Cultivars 1987.

Clone	Total Yield (g/plot)	Projected Yield (kg/ha)	Average 100 Berry Weight (g)
NBBC1	6405	5338	122
Northland	2027	1689	133
Blueray	1159	966	171
Patriot	1136	946	250
Burlington	400	334	125
Bluecrop	256	213	204
Spartan	194	162	270
LSD (.05)	1561	1301	35

LOWBUSH BLUEBERRY CLONE EVALUATION

C. Murray, B. Dykeman and S. Michaud

Abstract: *This report concludes a program for evaluating the adaptation of the CDA Kentville lowbush blueberry clones to New Brunswick conditions. In 1987, plant characteristics, ornamental value, and fruit taste test results were recorded.*

ÉVALUATION DE CLONES DE BLEUET NAINS

Résumé *: Le présent rapport termine un programme d'évaluation de l'adaptation des clones de bleuet nains d'Agriculture Canada à Kentville aux conditions climatiques prévalant au Nouveau-Brunswick. En 1987, les caractéristiques des plants, leur valeur ornementale et les résultats des essais de saveur des fruits ont été enregistrés.*

INTRODUCTION: Twenty-seven (27) clones were planted in a replicated trial in 1979. Yields, bloom dates were taken in the years 1981-83, then the trial was pruned. Yield and bloom dates were again taken in the years 1985-87. Other data, including plant characteristics, ornamental value and fruit taste have also been evaluated.

MATERIALS AND METHODS: Twenty-seven clones were planted in a RCBD with four replications, at the provincial nursery in Hoyt. Spacings were 45 cm between plants and 90 cm between rows, with 12 plants per row (10 being harvested). The site, a riverbank sandy loam, was manured prior to planting. The plants were mulched with sawdust after planting to a depth of 5 cm. Fertilizer was applied yearly in the spring at a rate of 300 kg/ha (15-15-15). Except in 1987, irrigation was applied as needed.

RESULTS AND DISCUSSION: Table 1 gives the yield data for 1987. The heavy snow cover of 1986-87 ensured that the plants were undamaged, and this is reflected in the yields. Even though the plants were not irrigated, some clones averaged 1 kg per plant, or 24 T/ha. The average 100 berry weight is low (45.83 g overall). This is believed to be a result of the dry summer and lack of irrigation.

Harvest started July 27 and concluded August 7. This first harvest was by hand, and only ripe berries were picked. A second harvest, on September 2, was done with a rake. Not all clones needed to be harvested a second time.

Table 2 summarizes the results from 1985-87 inclusive. From this table, we can see how the more vigorous clones such as 678 and Fundy increased yields throughout the 3-year harvest. Less vigorous clones, such as Augusta and 907, either have a first year flush or maintain a low to moderate yield over the three years of a cropping cycle.

CONCLUSION: The clones which combined high productivity with high fruit quality were Fundy (69-1), 678 and 315. These were followed by 633, 671, Blomidon and Cumberland. Further flavour evaluation of clones 685, 686 and 70-62 are required before dropping these clones.

For home garden sales, Fundy and clones 678 and 315 are recommended because of excellent plant form, leaf quality and fall color in addition to their yield and fruit performance.

Table 1. Performance of Lowbush Blueberry Clones in Their Eighth Year. 1987.

Clone	Total Yield (g/plot)	100 Berry Weight (g)	Projected Yield (T/ha)
678	10042.1	55.6	24.8
Fundy	9998.6	56.7	24.7
686	9228.9	38.0	23.8
723	9011.1	50.6	22.2
70-85	8870.9	42.5	21.9
705	8759.7	41.4	21.6
687	8422.8	41.0	20.8
722	7489.1	38.8	18.5
Cumberland	7432.1	38.1	18.4
70-62	7343.5	55.4	18.1
Chignecto	7158.5	30.9	17.7
671	689	48.1	17.0
315	6730.9	44.5	16.6
633	6640.7	41.6	16.4
799	5924.1	31.9	14.6
Brunswick	5900.8	56.3	14.6
676	5815.8	41.5	14.4
662	5780.4	27.4	14.3
206	5626.8	30.5	13.9
907	5427.6	44.7	13.4
Blomidon	5400.3	60.2	13.3
Me3	5102.4	37.4	12.6
Me04161	4545.1	67.1	11.2
70-60	4508.8	48.0	11.1
759	3324.4	45.0	8.2
758	3035.1	59.7	7.5
Augusta	2535.0	64.6	6.3
LSD (0.05)	3239.3	12.7	8.0

Table 2. Performance of Lowbush Blueberry Clones Over a 3-Year Harvest Cycle

	Yield (T/Ha)			3 Year Average (T/Ha)	Flavor Rating*
Clone	1985	1986	1987		
Fundy	7.1	31.0	24.7	21.0	E
678	7.9	26.1	24.8	19.6	G
685	10.5	22.5	20.8	17.9	F
315	7.8	28.4	16.6	17.6	E
686	10.5	17.8	23.8	17.3	F
723	6.4	20.2	22.2	16.3	P
70-85	9.0	17.8	21.9	16.2	P
70-62	7.9	22.4	18.1	16.1	F-G
Chignecto	5.2	22.7	17.7	15.2	F
633	9.6	19.1	16.4	15.0	E
722	6.9	18.3	18.5	14.6	P
671	8.0	14.8	17.0	14.5	G
Blomidon	7.3	21.3	13.3	14.0	E
Cumberland	6.0	17.5	18.4	13.9	E
799	6.1	15.3	14.6	12.0	G
662	7.8	12.9	14.3	11.7	G
Me04161	7.3	16.3	11.2	11.6	F
705	6.3	6.6	21.6	11.5	E
907	7.5	11.6	13.4	10.8	E
676	5.9	11.6	14.4	10.6	F
Me3	8.2	10.2	12.6	10.4	E
206	5.0	12.1	13.9	10.3	P
70-60	6.4	13.3	11.1	10.3	E
Brunswick	7.5	4.8	14.6	9.0	G
759	7.0	10.7	8.2	8.7	E
Augusta	8.3	8.5	6.3	7.9	F
758	8.4	5.1	7.5	7.0	E
LSD (.05)	5.1	9.4	8.0	5.2	

*E - excellent, G - good, F - fair, P - poor

ESSAI DE VARIÉTÉS DE FRAMBOISES

R. Tremblay et B. W. Dykeman

***Résumé**: Un essai de huit variétés de framboises a été établi en 1984 au Centre Horticole de Hoyt, Nouveau-Brunswick. Le but de cet essai est de les évaluer pour leur performance de production, résistance aux températures rigoureuses et réactions face aux méthodes culturales conventionnelles. Les fruits ont été récoltés pour une deuxième année consécutive.*

RASPBERRY VARIETY TRIAL

***Abstract**: A trial involving eight raspberry varieties was established in 1984 at the Horticultural Centre in Hoyt, New Brunswick. The objective of this trial was to evaluate their production performance, resistance to harsh temperatures, and reactions to conventional cultural methods. The fruit was harvested for a second year in a row.*

INTRODUCTION: Cette étude, débutée en 1984, a pour but d'évaluer les possibilités d'adaptation de huit variétés de framboises aux conditions rencontrées au Nouveau-Brunswick.

MÉTHODES ET MATÉRIAUX: Pour plus d'information veuillez consulter les rapports de 1984, 1985 et 1986. Les variétés de framboises utilisées dans cet essai sont: GATINEAU; HERITAGE; NOVA; BOYNE; FESTIVAL; COMET; U.S. LATHAM et K65-12.

RÉSULTATS ET DISCUSSION: La variété BOYNE est celle qui a atteint le plus haut rendement. (Voir tableau 1). Pour le poids moyen de 100 fruits, la variété NOVA est la gagnante pour une deuxième année consécutive (voir tableau 2). Une piètre croissance des plants de framboises a été observée en 1987. Une application de Ridomil a été effectuée au mois de septembre 1987. Tous les plants vont être coupés avant l'épanouissement des bourgeons en 1988, donc aucune récolte avant 1989. Des analyses foliaires ont été effectuées en 1987 pour pouvoir contrer des déficiences ou excès lors d'application d'engrais en 1988.

TABLEAU 1 Rendements de cultivars de framboises, 1987

	Kg/traitement	Kg/ha
Boyne	11.39	2531
Gatineau	10.03	2229
Nova	8.35	1856
U.S. Latham	5.07	1127
K65-12	4.56	1013
Festival	3.74	831
Comet	3.28	729
Heritage	1.74	387

TABLEAU 2 Poids moyen de 100 fruits de framboises, 1987

	POIDS DE 100 FRUITS (g)
Nova	244
K65-12	223
Comet	192
Festival	180
Boyne	176
Gatineau	174
U.S. Latham	152
Heritage	135

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COMMERCIAL FEASIBILITY OF RED CURRANTS

R. Tremblay, and B.W. Dykeman

Abstract: *A plantation of red currants was established in 1985 at the N.B. Horticulture Center, Hoyt, N.B. Yield results have been evaluated for two years.*

FAISABILITÉ COMMERCIALE DE LA CULTURE DES GADELLIERS

Résumé *: On a procédé en 1985 à la création d'une plantation de gadelliers au Centre horticole de Hoyt, au Nouveau-Brunswick. Les rendements obtenus ont été évalués pendant deux ans.*

INTRODUCTION: Currants are a member of the Ribes species and the fruit is a true berry. Rarely, if ever, are they available in New Brunswick markets. This bush-type fruit is easy to grow and very hardy. Currants have a bushy non-spreading growth habit. Most currants are self-fruitful, hence there is usually no need to provide for cross-pollination. Red currants fruit at the base of 1 - year old wood and more so on spurs of 2 - and - 3 - year - wood. Older wood produces inferior fruit. The object of pruning is to remove wood older than three years and to replace it with a suitable number of younger shoots. This trial was established to evaluate the commercial feasibility of growing red currants in New Brunswick.

MATERIAL AND METHODS: The red currant cultivar Von Tets was planted in 1985 at the N.B Horticulture Center, Hoyt, N.B.. The spacing was set at 2 meters between the rows and 1 meter apart on the row. Five centimeters of sawdust was applied as a mulch in 1985. No irrigation water was applied in 1986 and only in August 1987. No pruning was done in 1986 nor in 1987.

RESULTS AND DISCUSSION: In 1986, 9.48 kg (1185 kg/ha) of red currants was harvested from 40 bushes and 23.77 kg (2971 kg/ha) on July 7, 1987 (100 berry count = 72.2g). The currant aphids did some serious damage on the leaves in 1987.

CONCLUSION: In order to pursue this trial, pruning the bushes will be a must in 1988. Better pests control will have to be followed in order to harvest a good quality fruit. For home gardens or local markets, the ease of culture, small amount of space required, long life of the plants (10 - 15 years), and the many culinary uses to which the currants are adapted commend them to consideration.

ACCELERATED PRODUCTION OF SHADE TREE WHIPS

B.W. Dykeman and G.A. Nickerson

Abstract: *Evaluation was continued on the rapid production of shade tree whips using an unheated greenhouse with the objective of producing 2 m whips in one growing season. Overall height increases of greenhouse grown trees averaged 301% greater growth than field grown trees across eight species. The growth objective was met by three species: Acer platanoides, Acer saccharum and Betula papyrifera.*

PRODUCTION ACCÉLÉRÉE DE FOUETS D'ARBRES D'OMBRAGE

Résumé : *L'évaluation de la production rapide de fouets d'arbres d'ombrage en serres non chauffées s'est poursuivie avec en vue l'objectif de produire des fouets de deux mètres en une seule saison de croissance. L'augmentation globale de la hauteur des arbres cultivés en serre était en moyenne 301 % supérieure à la croissance des arbres cultivés dans un champ pour les huits essences. L'objectif de croissance a été atteint pour trois essences : Acer platonoides, Acer saccharum et Betula papyrifera.*

INTRODUCTION: The Maritime market for shade trees is estimated at $2.5 million a year. In the past, this market has been filled entirely by imported nursery stock. While N.B. nurseries feel confident that most evergreens and deciduous shrubs can be grown competitively in N.B., it has been assumed that we were unable to compete with western grown shade trees when sold in the 2-5 cm caliper size (90% of sales).

On the west coast it is possible to attain 3 m whips in one year, due to their long and moderate growing season. In N.B. 50-100 cm of growth is the norm. To compete with imported stock on quality and price, it will be necessary to attain a 2 m straight whip in one growing season. Some headway in obtaining better field growth can be made by ensuring optimum field management, including such practises as soil fumigation, irrigation, high soil organic matter, and monthly fertilization. However, for most species intensive field management will still not produce the growth desired.

A project was continued in 1987, to evaluate further the use of an unheated polystructure to produce shade tree whips and to compare growth in the polystructure with field growth.

MATERIALS AND METHODS: Liner stock of *Acer saccharum, A. platanoides, Betula papyrifera, Aesculus glabra, Gleditsia triacanthos "Inermis"* and *Quercus rubra* were planted in an unheated polyethylene greenhouse and in the field April 24, 1987 and May 8, 1987 respectively. Two species *Syringa reticulata* and *Quercus palustris* were transplanted as two year old stock into the unheated polyhouse. Two year old field stock remained in place for comparison. The soil of each site consisted of a riverbank sandy loam with a pH of 5.6-5.8. The greenhouse soil was amended with peat moss and "Agrisoke". No amendments were made to the field soil.

Both sites were fertilized with 5-20-20 at 1000 kg/ha before planting. Greenhouse stock was irrigated using a twin wall trickle irrigation system. The field stock was irrigated as required by solid set overhead irrigation equipment.

Plants were spaced in the greenhouse at 30 cm in the row and 60 cm between rows. Field stock was planted 60 cm apart in rows 100 cm apart. Twenty trees of each species were grown for a total of 160 trees per site.

All stock was staked and pruned as required. Lateral shoots were tipped back 10-15 cm to maximize leaf area and concentrate growth vertically.

Kelthane (miticide) was applied twice to all plants to inhibit a mite population which was particularly high on the greenhouse grown stock. "Pirimor" was applied as required to minimize aphid population.

Plant height measurements were taken one week after planting and in late fall (October) after vegetative growth was finished.

Plastic was removed from the greenhouse in late September to facilitate hardening off. The plants were hand dug in late October and placed bare root in a cold storage chamber maintained at 2-4°C and 90% R.H.

RESULTS AND DISCUSSION: The trial objective of producing a 200 cm tree whips in a polyhouse in one growing season was accomplished for 3 out of eight species: *Aces platanoides, Acer saccharum* and *Betula papyrifera* (Table 2). A similar study performed in 1986 met this objective with one tree specie: *Sorbus intermedia* (Dykeman 1986). While the other species tested this year did not attain the 200 cm growth, they did average 285% greater growth under plastic than in the field (Table 1).

The two oak species, *Quercus rubra* and *Q. palustris* are notably slow growers and would require 4-5 years in greenhouse culture to produce a 200 cm tree. (*Q. palustris* was a 2 year transplant.)

Aesculus glabra had a lower overall height in the greenhouse but averaged greater net increase in spite of heavy spider mite population which had defoliated most of the plants by mid-August. It is slow to establish and smaller shade tree species so would require 2-3 years of greenhouse culture to produce a reasonable whip. This compares to 4-5 years of field growth. *Syringa reticulata* is in the small shade tree category as well and would require 2-3 years to produce a 150-200 cm whip.

It has been calculated that the total annual cost for producing tree whips under plastic is $0.80 per tree (Dykeman 1986). This would be economical even if compounded for those trees requiring 2-4 years with such a system as the end cost for a 200-300 cm caliper tree ranges from $20.00 - $40.00.

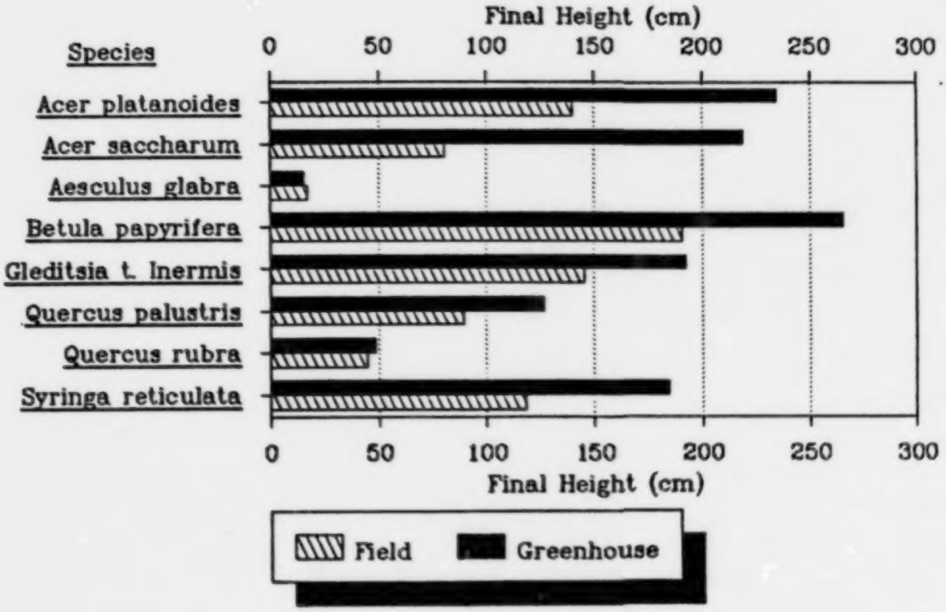
Further study will be done in 1988 to see if the 301% average growth increases established for greenhouse grown stock can be maintained over those plants grown in the field.

REFERENCES: Dykeman, B.W. 1986. Accelerated Production of Shade Tree Whips., Adapt. Res. Rept. 8:51-54.

Table 1. The comparative growth of shade tree whips grown in an unheated greenhouse and in the field for one season at the N.B. Horticultural Centre (Sept. 1987).

Taxa	Ave. increase in Height (cm) Field	Ave. increase in Height (cm) Greenhouse	% Increase
Acer platanoides	37.0	134.2	363
Acer saccharum	36.9	155.5	421
Aesculus glabra	1.1	6.1	554
Betula papyrifera	70.7	144.6	204
Gleditsia tricanthos "Inermis"	42.5	87.2	205
Quercus palustris	20.0	57.5	287
Quercus rubra	5.5	10.1	184
Syringa reticulata	32.7	63.2	193
	Ave. % increase		301%

Table 2. Comparison of final height measurements of eight ornamental tree species grown in a greenhouse and in the field at the Hoyt Hort. Centre (1987)



VARIETY TRIAL OF COLORED PEPPER, 1987

Jacques Lavoie and Tim Johnson

Abstract: *Eleven pepper varieties of different colors were evaluated on there performance such as; yield, % ripe fruit and % of unmarketable fruit. Sweet Chocolate, Earliest Red Sweet and Stokes Early Hybrid showed best overall performance in relation to are short growing season. The variety Chocolate Bell and Gold Crest should be omitted from futur trials because they did not mature at all.*

ESSAIS DE VARIÉTÉS DE POIVRON DE DIFFÉRENTES COULEURS EN 1987

Résumé *: Onze variétés de poivron de différentes couleurs ont été évaluées en fonction de différents facteurs comme le rendement à l'hectare, le pourcentage de fruits mûrs et le pourcentage de fruits non commercialisables. Les variétés Sweet Chocolate, Earliest Red Sweet ainsi que la variété Stokes Early Hybrid ont été celles qui ont donné le meilleur rendement compte tenu de la saison de croissance relativement courte. Les variétés Chocolate Bell et Gold Crest devraient être omises des futurs essais puisqu'aucun poivron n'est parvenu à maturité.*

INTRODUCTION: The frost-free period in Atlantic Canada is generally adequate for most vegetable crops. However, heat loving crops such as tomatoes and peppers are limited to a few locations. The use of plastics will alter the microclimate of the crop to provide sufficient heat for crops such as peppers. We are most familiar with green peppers, but we should realize that all peppers, when mature are red yellow or some other color than green. From the time of fruit set to mature green or black it takes approximately 30 to 35 days. To mature red, purple, chocolate or yellow and additional 20 to 25 days is required. The objective of the trial was to find which cultivars of colored peppers could be feasibility grown in N.B.

MATERIALS AND METHODS: Eleven pepper varieties of different colors were seeded in a greenhouse on April 27 and transplanted in the field on June 4. The trial was set up in randomized complete block design with two replicate blocks containing each of the 11 varieties. Each plot had 2 rows, 6.1 m long, spaced at 60.8 cm apart. Plant were spaced 45 cm apart in the row. Fertilization before planting consisted of 320 pds/acre of 15-10-10. Black plastic mulch was covering the surface of the soil to eliminate weeds, increase the soil temperature and to conserve the soil moisture by eliminating surface evaporation. Fresh weight, unmarketable weight ("disease and under size pepper") and ripe fruit were recorded.

DISCUSSION & CONCLUSIONS: Peppers are along season, great loving crop. The crop has to be established from transplants because our short growing season. Unlike tomato plants, all peppers suffer from a severe transplant shock once field set. This was especially true this year with the dry, windy condition in the spring. Transplants even suffered defoliation. This resulted in a loss of valuable growing time which would have caused a reduction in the yield. The response from the plant to that kind of stress may varied between cultivar and may explain some differences in the yield.

Peppers have a small root system and are poor feeders which make them succeptible to stress. Water is also important at the time of fruit set to prevent a slow down in the plant growth and predispose it to a reduction of yield. The advantage of irrigation in a dry year could result of an increase of 50 to 75% in the yield. Considering the dry season most varieties performed very well. Sweet Chocolate, Earliest Red Sweet, and Stokes Early Hybrid were the most promissing peppers with a good fruit weight/plant and low % of unmarketable peppers. The Sweet Chocolate variety produced a large pepper with a thick wall.

The two most promissing yellow varieties were Yellow Bell and Gypsy Hybrid. Both had a good fruit weight/plant and a low % of unmarketable peppers. Gypsy hybrid has fruit with wide shoulders slightly tapered to farily blunt ends as compared to a bell shape for Yellow Bell. The variety Chocolate Bell and Gold Crest should be omitted from future trials because they did not mature at all. Irrigation should be considered for any further trial.

Table 1 : Pepper performance trial, 1987

Variety	Fruit/ plot	Fruit/ plant	Fruit weight /plant (g)	Ripe fruit %	Unmarketable pepper %
Gypsy Hybrid	171	6.82 ab	654.5	100	0.8
Goldie	127	5.08 ab	556.4	100	16.7
Super Stuff	99	3.94 ab	378.1	100	19.2
Yellow Bell	238	9.52 a	907.9	100	6.2
Purple Bell	128	9.12 ab	567.7	100	20.6
Golden Summer	120	4.78 ab	247.2	0	31.2
Chocolate Bell	54	2.16 b	276.2	0	0
Sweet chocolate	138	5.52 ab	1164.5	67.1	1.2
Earliest Red Sweet	223	8.92 ab	1219.4	80.8	2.6
Stokes Early Hybrid	194	7.74 ab	1222.6	84.4	4.7
Gold Crest	173	6.96 ab	839.7	0	0

CELERY VARIETY TRIAL ON ST-CHARLES PEAT BOG, 1987

Jacques Lavoie and Tim Johnson

Abstract: *Fourteen varieties of Celery were evaluated on the St-Charles Bog, Richibucto. The standard recommended variety Stokes Imp Utah 52-70 performed well; however, several other varieties tested gave similar results. Bishop and Tendercrisp showed best overall performance but without significant difference from Utah 52-70.*

ESSAI DE VARIÉTÉS DE CÉLÉRI DANS LE MARAIS DE TOURBE DE ST-CHARLES, 1987

Résumé *: Quatorze variétés de céleri ont fait l'objet d'une évaluation dans le marais de Saint-Charles. La variété standard recommandée, Stokes Imp Utah 52-70, a donné les mêmes résultats que précédemment. Les variétés Bishop et Tendercrisp ont donné le meilleur rendement global, mais ce dernier ne diffère pas beaucoup de la variété Stokes Imp Utah 52-70.*

INTRODUCTION: A few years ago, plots were set up in St-Charles Bog to investigate the possibility of producing a number of alternative crops. The celery seemed to be one of the most promising crops. In the same time, it was providing a rotation of the land which would reduce the risk of disease and insect build-up. For the second year, a trial to determine which varieties would be the most suitable for the area was established.

MATERIALS AND METHODS: Fourteen varieties of celery (Apuim graveolens var. dulce) were seeded in a greenhouse on April 14 and transplanted in the field on June 9 and 10 in St-Charles Bog, Richibucto. The trial was set up in randomized complete block design with five replicate blocks. Each plot contained 60 plants in 3 rows of 20. One sampling row with sixteen plants were harvested from the middle row. The blocks were harvested on August 24 and 25. Each plant was trimmed, evaluated for taste, weighed, and measured. Trim weight was taken for each plant. Length was measured from the upper most leaf tip to the stem base. Width was measured at the widest point in the basal region. Flavour was evaluated by 10 persons who sampled each variety and gave their opinion of the taste (1 very good - 4 poor).

Table 1 - Comparison of the mean stem weight, trim weight and dimensions of 14 celery varieties grown in St. Charles Bog, N.B. 1987

Variety	Width (cm)	Length (cm)	Weight (gm)	Trimming loss	Taste
Stokes Imp. Utah 52-70	8.4	69.4	1201.9	32.8	2.4
Tendercrisp	8.3	72.7	1030.9	18.1	2.4
Tall Green Light	8.2	68.0	891.0	33.6	-
Summit	7.8	64.7	836.1	22.4	2.9
Bishop	8.7	72.4	1062.0	15.8	2.8
Florida 683	8.4	67.0	950.9	22.4	2.8
Surepak	7.5	73.9	828.7	32.9	-
Ventura	8.0	71.5	1006.4	21.1	2.8
Deacon	8.4	70.0	1016.8	21.1	2.4
Green Giant	9.3	76.9	1201.8	34.4	2.8
Strain 2-14	8.1	70.5	936.8	32.6	2.7
Tall Utah 52-75	7.6	58.7	676.0	28.9	3.7
Foodhook	8.8	63.6	873.1	36.2	2.7
Latham Selfira	8.5	63.9	979.7	33.6	-
LSD.05	1.4	14.82	386.61		

* Taste test : 1 Very Good, 2 Good, 3 Fair, 4 Poor.

RESULTS & CONCLUSION: Water requirement is a determining factor in celery production, because they have a shallow root system and suffer very readily from drought. Considering the dry growing season, most varieties performed very well.

Bishop and Tendercrisp had the best over all results in all parameters without significant difference as compared with the standard. Green Giant was the greatest in size and weight but at the same time had the highest percentage of loss due to trimming which also represents an added cost during harvesting. Green Giant is a great looking plant with big stalks. Deacon and Ventura also showed potential with their low % of trimming loss combined with good weight. Varieties such as Surepak, Foodhook, Tall Utah 52-75 had the poorest performance in the evaluation. Latham Selfira, the blanching variety had some problem with blight and was really brittle.

CONCLUSION: In spite of the dry growing season, most varieties did very well. Bishop Tendercrisp, Green Giant, Ventura and Deacon demonstrated promise as potential varieties for the area. Varieties such as Surepak, Foodhook Tall Utah 52-75 and Latham selfira showed a little commercial potential and should be omitted from future trials.

CHEMICAL ENHANCEMENT OF NEW FIDDLEHEAD CROWN DEVELOPMENT

B.W. Dykeman and C. Murray

Abstract: *The use of the plant growth regulator, paclobutrazol, to enchance new crown development in the ostrich fern was evaluated. There appeared to be positive response to new crown development, but this will require verification in field studies.*

AMÉLIORATION DU DÉVELOPPEMENT DES NOUVELLES POUSSES DE FOUGÈRE À L'AUTRUCHE AU MOYEN DE PRODUITS CHIMIQUES

Résumé: *L'utilisation du régulateur de croissance paclobutrazole afin d'améliorer le développement des nouvelles pousses de fougère à l'autruche a fait l'objet d'une évaluation. Il semble que la réaction ait été positive en ce qui concerne le développement des nouvelles pousses, mais il faudra vérifier ces résultats sur le terrain.*

INTRODUCTION: A critical factor in establishment of fiddleheads is the rate of daughter crown production. New crowns develop when rhizomes produced by the mother crown cease linear growth and curve upward towards the soil surface. This phase change has been shown to be a quantitative short-day response (Dykeman, 1985). The upward curvature of the rhizome apex is accompanied by profuse root development in the vicinity of the curvature, a shift from cataphyll type leaf development to crozier development, and an apparent loss of apical dominance over lateral meristems. This loss of apical control gives rise to the development to 1-4 new lateral rhizomes in the vicinity of the curvature.

Regardless of the causal stimulus which initiates this phase change, the resulting growth suggests as reduction in Giberrellin and auxin activity. An earlier screening study in 1986, found no significant growth responses to a number of common auxin inhibitors. In 1987 an initial study was carried out to evaluate the effect of the gibberellin inhibitor, paclobutrazol (PP333) on the crowning-out process.

MATERIALS AND METHODS: A study was established in a shaded greenhouse using 2 year old dormant plants of clone N.B. 35. Six plants per plot with three replications were planted on June 19, 1987 in raised beds using 0.5 m^2 per plot. The growing medium was a standard peat:perlite mix. The plants were planted so the tops of the crowns were just covered with medium. Plants were fertilized once a week at a rate of 400 ppm of N, P_2O_5 and K_2O in the irrigation water until August 3. Plants were exposed to a long-day photoperiod until July 20. Then an 8 h short day photoperiod was initiated. The crowns were lifted January 5, 1988 and placed in cold storage for field planting in 1988. Data of primary (1°) rhizomes, secondary (2°) rhizomes and new crown development were recorded.

The paclobutrazol treatments were as follows:

Treatment No.	Method of Application	Concentration (ppm)	Time of Application (days after planting)
1	Control		
2	Foliar Spray	1500	80
3	Foliar Spray	750	80
		750	110
4	Foliar Spray	750	80
		750	110
		750	140
5	Soil Drench	1000	80
			110
6	Soil Drench	1000	80
			110
			140

RESULTS AND DISCUSSION: Due to variability between plants and limited plot size, there were no significant differences between treatments. However, the trends established by the treatments suggested that paclobutrazol should be tested further.

When only one early application PP333 was applied, the chemical appeared to affect primarily the parent crown, stopping activity in the crown, and allowing the development of more primary rhizomes. However, even with the single early treatment (equivalent to mid-August), the lengths of the primary rhizomes were reduced and a higher percentage of these rhizomes crowned out.

Further applications of PP33 reduced rhizome growth even more. However, the percentage of primary rhizomes crowning out increased with increasing PP333 applications.

From this initial study, it was apparent that both the rate and timing of paclobutrazol will be critical if it were to be used for promoting new crown development. If used early in the season (early July-mid-August), it would probably result in greater primary rhizome development. If used later in the season (September - mid-October), its effect would be to stop primary rhizome growth and to stimulate crowning out of rhizomes. Investigation in the field with larger plot sizes will be required to determine the significance of the response to paclobutrazol.

Table 1. Effect of paclobutrazol on the growth of ostrich fern rhizomes 1988.

Treatments	No 1° Rhiz.	Total length 1° Rhiz.	No. Rhiz. crowned out	No. 2° Rhiz.	Total Length 2° Rhiz.	% 1° Rhiz. Crowned Out
Control	9.0	125.2	2.3	0	0	25.6
1500F1	13.3	201.0	4.0	4.0	51.3	30.1
750F2	10.0	100.7	5.0	5.7	79.2	50.0
750F3	7.7	72.2	4.3	1.0	12.3	55.8
1000D2	6.3	71.5	5.0	4.0	47.2	79.4
1000D3	1.3	11.7	1.3	1.3	17.2	100.0
LSD (P=.05)	10.9	148	6.6	6.7	81.9	-

OSTRICH FERN CLONAL SELECTION PROGRAM

B. Dykeman and C. Murray

Abstract: *Selection of superior clones of the ostrich fern is continuing. In 1987, the first harvest data was collected on a replicated trial of early selections. Data was also collected on the 1000 clone observation planting.*

PROGRAMME DE SÉLECTION DE CLONES DE FOUGÈRE À L'AUTRUCHE

Résumé : *La sélection de clones de qualité supérieure de fougère à l'autruche se poursuit. En 1987, les premières données sur la récolte ont été recueillies sur une parcelle expérimentale de variétés hâtives. Les données ont également été recueillies à la suite de l'observation d'une plantation de 1 000 clones.*

INTRODUCTION: From work carried out from 1976 - 1983, (Dykeman, 1985 a) it was clear that the selection of superior clones of the Ostrich fern was possible, and that large advances in productivity should be realized by such selection. It was found that broad genetic variability existed for such traits as: the rate of rhizome production, the number of croziers produced and released per year, the size of crozier; as well as, the time of emergence. Therefore, it was decided to continue a program of clonal selection and to expand the selection base.

METHODS AND MATERIALS: In 1984, a collection of 1,000 clones were established at the N.B.H.C. on a riverbank sandy loam soil. These clones had been ramdomly collected as single crowns from throughout N.B. The crowns were planted in single plant plots 2m apart in and between rows. Plants were mulched with 5 cm of sawdust and fertilized with 15-15-15 at 600 kg/ha per year. No selection was to be carried out on this material until year four (1988).

Also in 1984, sixteen (16) clones which were selected from an earlier collection of 54 clones were established in a randomized block design with three replications and 12 plants per plot. Plants spaced 0.5 x 2.0 m. Plots were mulched and fertilized as above. Preliminary data collection was initiated in 1985 and 1986 but the study will require at least 8 years of evaluation.

In 1987, the first harvest was made and data on the components of yield, namely crown density, frond and crozier size, and the number of fronds produced per crown were collected. (Table 1)

RESULTS AND DISCUSSION: After three years of establishment, the first harvest from the advanced clones ranged from 310. kg/ha to 927.5 kg/ha (Table 1). The total yield of croziers was in line with earlier predictions on crop establishment (Dykeman, 1987), but the components of that yield differed from earlier expectations. The plant density of these clones increased at a much greater rate that expected, yielding a 20-40 fold increase in plant density in 4 years. However, crozier size has increased slower than expected and remains well below the desired 5g/crozier size.

The harvest period for the 16 clones lasted only 15 days in 1987 with a spread among clones of only 7 days in emergence.

In the clonal screening trial productivity indexes ranged from 0.4 to 22.1 among clones (Table 2). The distribution curve of productivity indexes was skewed towards the low end of the scale with only 5% of the clones falling above the median P.I. of 11.0.

Table 1 Performance of selected clones of the Ostrich fern after 3 growing seasons 1987.

Clone	Plot Yield (g)	Projected Yield (kg/ha)	Crozier wt.(g)	Plant Density (pl/m^2)	Frond Height (cm)
NB 5	557	928	2.0	41	77
NB 4	534	889	2.1	39	74
NB 12	503	838	2.2	38	78
NB 19	500	834	2.5	26	79
NB 44	457	762	2.2	33	74
NB 8	444	739	2.2	21	83
NB 6	420	700	2.7	22	86
NB 21	396	659	2.5	33	80
NB 42	351	586	1.8	42	74
NB 53	283	472	2.3	35	77
NB 41	273	454	2.6	30	74
NB 14	269	449	2.2	36	80
NB 18	235	392	2.2	38	76
NB 33	227	378	2.9	35	84
NB 39	210	350	2.5	39	76
NB 13	186	310	2.9	24	85
LSD(p=.05)	145	243	0.6	13.	5.8

Table 2 Clonal screening program statistics, 1988.

Parameters	Range	Mean	Standard Deviation
Plants/m^2	1 - 26	7.8	4.7
Fronds/crown	2.3 - 21	9.0	3.2
Frond height (cm)	30.2 - 112	77.6	22.1
Productivity Index	0.4 - 22.1	5.9	3.6

FIELD ESTABLISHMENT OF FIDDLEHEADS

B. Dykeman and C. Murray

Abstract: *A study was established in 1985 to evaluate the effect of planting depth and mulching on early rhizome production and new crown development in the field. After 2 years, plant vigor was improved by both deep planting and mulching, but new crown development was not enhanced.*

CULTURE DES CROSSES DE FOUGÈRE DANS DES CHAMPS

Résumé : *Une étude a été entreprise en 1985 afin d'évaluer quels étaient les effets de la profondeur de plantation et du paillage sur la production hâtive de rhizomes et le développement de nouvelles pousses dans les champs. Après deux ans, on peut affirmer que la plantation en profondeur et le paillage ont permis d'accroitre la vigueur des plants sans toutefois améliorer le développement des pousses.*

INTRODUCTION: A goal in establishing any perennial crop is to bring it into full production in as short a period of time as possible. In fiddleheads, this means 1) increasing the plant population from the 10,000 plant planting-rate to 300,000 plants per hectare and, 2)attaining full crozier size potential. Rapid plant reproduction in the field is dependent on the rate of rhizome production and on the vigor and longevity of the mother crowns.

MATERIALS AND METHODS: The study, established on a riverbank sandy loam, utilized 1 1/2 year old dormant plants of clone NB44 in a 2 factor RCBD. Plots were 2m x 6m with 12 plants per plot with four replications. The treatments were as follows:

Planting depths:

1. planted with crown at previous soil level.
2. planted with crown just covered with soil.
3. planted in a 15 cm trench with crowns at the bottom of the trench.

Mulching:

1. no mulch
2. 5 cm mulch the first fall, and 2 cm applied each fall thereafter.
3. 5 cm mulch applied once at planting time.

Fertilizer (15-15-15) was incorporated at a rate of 600 kg/ha in the spring before planting.

DISCUSSION: Data was recorded in 1986 and again in 1987. Parameters measured included the rate of daughter crown production and several components of yield - frond height, fronds per crown, etc. These components were used to calculate a productivity index (P.I.).

While no significant differences have yet emerged, there is a possitive trend favouring increased planting depth for P.I., frond height and fronds/crown. However, the plant density was suppressed by both deep planting and annual mulching. This is opposite to the expected trend of more rhizome production with mulching and deep planting. The data collected, however, only records crowned-out rhizomes and does not provide a measure of actual below ground rhizome growth.

Another 2 years will be required to attain a measure of actual rhizome production. Crowning out of rhizome usually occurs as a result of a physiological check or environmental stress. Therefore the deep planting and annual mulching treatments which are producing more vigorous plants may in fact be producing vigorous rhizomes which are slow to crown-out in the absence of stress.

Table 1 Summary of 1987 yield component data for the fiddlehead field establishment trial.

	Treatment	Productivity Index	Frond Height (cm)	Fronds per crown	Plants per m^2
Depth of Planting	Original	4.2	45.9	10.8	8.5
	Top of Crown	4.5	48.2	11.2	8.3
	15cm Trench	5.0	50.3	11.3	8.9
Mulch	0	4.7	46.6	10.9	9.2
	At Planting	4.7	48.1	10.9	8.9
	Annual	4.4	49.6	11.4	7.6
LSD (.05)		1.2	5.6	0.8	1.8
Interaction		NS	NS	NS	NS

COMPARITIVE PERFORMANCE OF SELECTED CLONES AND THEIR PROGENY

B. Dykeman and C. Murray

Abstract: *A study was initiated in 1986 to determine the differences in productivity between selected clones and their progeny produced from spores via intergametophytic selfing. To date the clonal plants have proved more vigorous than their sibling progeny.*

PERFORMANCE COMPARATIVE DE CLONES SÉLECTIONNÉS ET DE LEUR PROGÉNITURE

Résumé: *Une étude a été entreprise en 1986 pour déterminer les différences de productivité entre des clones sélectionnés et leur progéniture, produite à partir de spores, par autofécondation entre gamétophytes frères. Jusqu'à présent, on a constaté que les clones étaient plus vigoureux que leur progéniture.*

INTRODUCTION: From early work on genetic variability and selection potential (Dykeman, 1985) it was clear that there is good potential for selecting high yielding clones of the ostrich fern. However, the move towards clonal cultivars, generally means higher propagation costs and therefore higher establishment costs. While these higher costs can be readily justified for many asexually propagated horticultural crops, the advantages have not been demonstrated for fiddleheads. Clearly, the cost of producing plants from spores is far less than the cost of plants from tissue culture - the current clonal propagation method.

In the production of plants from spores various levels of selfing and cross fertilization are possible. The most feasible system of propagation, which would allow some control of variability and therefore some degree of predictability, is analogous to self-fertilization in flowering plants. This system would involve the production of gametophytes (n) from spores of a single sporophyte (2n). The gametes produced by these gametophytes would be allowed to cross freely, resulting primarily in intergametophytic selfing (sib mating). This system would also allow a small degree of intragametophytic selfing, resulting in completely homozygous sporophytes. The numbers of the latter type should be low.

The objective of this study was to compare the performance, productivity and variability of several selected clones with that of plants produced from their spores via sib-gametophytic mating (self-fertilization); and thereby to determine the merits or necessity of clonal propagation.

METHODS AND MATERIALS: The study was established at the N.B. Horticultural Centre, Hoyt on June 3, 1986. Two year old crowns were utilized. Four clones; NB 6, NB 12, NB 39 and NB 53, were included in the study along with their progeny produced from spores via intergametophytic selfing. Ten (10) plant plots were used with three replications in a randomized block design. Plots were 5 m rows spaced 2 m apart.

The field was limed to approximately pH 6.5 prior to planting. Fertilizer (15-15-15 at 300 Kg/ha) was applied prior to planting and again in mid July. A 5 cm mulch of sawdust was applied in September, 1986.

RESULTS AND DISCUSSION: As can be seen in Table 1, the clonal plants produced by tissue culture were more productive than their progeny produced via spores. The components of yield (frond height, fronds per crown and plants/m^2) are summarized in the productivity index. This value rates the relative vigor and makes selection easier.

The sharply reduced vigor of the clonal progeny as compared to the clones was not expected. It was expected that the sporling plants would have a fair degree of variability but contain both superior and inferior plants to the parent clone. The low level of vigor among these plants suggest the release of weak recessive genes through the inter and intra-gamatophytic selfing from which they were derived. These early results suggest that production of plants via spores will not be a viable alternative to asexual clonal propagation.

REFERENCES: Dykeman, B.W., 1985. Genetic Variability and Selection Potential in the Ostrich Fern. In Ph.D thesis. University of New Brunswick. pp. 35-54.

Table 1. Comparitive Performance of Selected Clones of the Ostrich Fern and Their Progeny. 1987.

Clone	Productivity Index	Frond Height (cm)	Fronds per Crown	Number Daughters	Plants per m^2
39 c*	3.5	47.2	9.9	24.0	7.2
39 s	1.5	33.9	8.9	15.7	5.1
53 c	3.2	45.2	9.0	21.3	7.1
53 s	0.5	24.7	5.4	9.3	3.4
6 c	2.4	41.6	9.6	17.3	5.9
6 s	1.5	35.0	8.1	16.3	5.3
12 c	1.5	30.9	9.1	16.0	5.4
12 s	0.6	23.8	8.3	5.0	2.4
LSD (.05)	1.5	8.6	2.2	10.5	2.7
Clones	2.6	41.3	9.4	19.7	6.4
Siblings	1.0	29.4	7.7	11.6	4.0
Significance	**	**	*	*	*
Interaction	N.S.	N.S.	N.S.	N.S.	N.S.

*c - clones, s - progeny derived from spores

PROTEIN ENHANCEMENT IN ESTABLISHED ALFALFA

C.J. Duivenvoorden and C.H. McLean

Abstract: *The alfalfa protein enhancement capabilities of the experimental plant growth regulator UC93338 were evaluated in this study. Three rates of the product were compared with a check treatment in a 4 rep RCB design. Plots were established in a stand of pure Iroquois alfalfa planted in 1986. Applications of the product plus surfactant were made at the rosette stage of the crop after the first cut. Leaf to stem ratios were determined by the manual harvest and separation of 10 plants per plot. Actual plot yields were taken using a Rem flail harvester 04 August. All treated plots produced compact plants with higher leaf to stem ratios. However, dry matter and protein yields of all treated plots were less than the check plots. Component analysis showed that the dry matter yield losses were caused by small reductions in leaf yield and large drops in stem yields. Corresponding drops in leaf and stem protein yields contributed to lower overall protein production.*

ACCROISSEMENT DU CONTENU PROTÉINIQUE DES CHAMPS DE LUZERNE DÉJÀ EN CULTURE

Résumé : *Les capacités d'amélioration du contenu protéinique de la luzerne au moyen du régulateur de croissance UC93338 ont été évaluées au cours de cette étude. Trois taux du produit ont été comparés à celui obtenu dans une parcelle témoin ayant subi le traitement dans un dispositif expérimental en blocs divisés au hasard qui a été repris quatre fois. Les parcelles ont été prises dans un peuplement homogène de luzerne Iroquois pure semé en 1986. Les applications du produit additionné d'un agent de surface ont eu lieu au moment de la formation de rosettes après la première coupe. Le rapport feuilles par tige a été établi en récoltant manuellement dix plants par parcelle et en les séparant, toujours manuellement. La récolte réelle a été effectuée au moyen d'une moissonneuse à flagelles REM le 4 août. Toutes les parcelles traitées ont donné des plants compacts ayant un rapport feuilles par tige plus élevé.*

Cependant, le rendement en matières sèches et en protéines de toutes les parcelles traitées a été inférieur à celui des parcelles témoins. L'analyse des échantillons a démontré que les pertes de rendement en matières sèches ont été provoquées par de petites réductions du nombre de feuilles et par une diminution importante du rendement des tiges. Les pertes correspondantes de protéines dans les feuilles et dans les tiges ont contribué à diminuer d'autant la production globale de protéines.

INTRODUCTION: Alfalfa is gaining popularity in N.B. as farmers realize the potential of the crop. In addition to improving soil conditions and producing its own nitrogen supply, alfalfa produces more high quality protein per hectare than any other crop. It regrows readily after harvest, and may produce up to 3 cuts a year under N.B. conditions.

Alfalfa's high quality is largely accounted for by its leafiness. Leaves contain approximately 30% protein and are extremely palatable to livestock. Leaf protein is well balanced, rivalling animal proteins in quality. The ratio of leaves to stems in alfalfa is chiefly a genetically determined parameter somewhat influenced by environmental conditions. Attempts have been made, however, to increase leaf yields through the use of chemical growth regulators.

This study was conducted to evaluate the effects of a Union Carbide experimental chemical upon alfalfa leaf and stem protein and dry matter yields.

MATERIALS AND METHODS: This experiment was conducted in a vigorous stand of 1986 alfalfa. A 4 replicate, 4 treatment randomized complete block design was used with a 3 x 8.5 m plot size. Staking was done after the first harvest had been taken, and treatments were applied 19 June with a CO_2 wand sprayer when the crop was at the rosette stage. Three rates of the PGR, .25, .50 and 1.00 kg ai/ha, were compared to a check. Harvest took place on 04 August, during early budding. Ten plants were collected from each plot, and were manually separated to determine component ratios. The remainder of the plot was harvested with a Rem flail harvester. Samples of both leaves and stems were lab analyzed, and leaf and stem protein and dry matter yields were calculated.

RESULTS AND DISCUSSION: Visible effects due to PGR application were evident in all treated plots, but the end objective of increased protein was not achieved. Plants in treated plots were compact in appearance, and, upon analysis, were found to contain proportionally more leaves than those in check plots (Fig. 1). However, the higher ratio of leaves to stems was due to a loss of stems rather than an increase in leaf material. As shown in Fig. 2, the yield of stems decreased from over 1000 kg/ha in the check plot to an average of about 650 kg over the 3 treatment levels. Leaf yields were also suppressed, but to a lesser extent. The total protein yield of each plot was proportional to total dry matter yield, and was considerably reduced by all levels of the PGR (Fig. 3). Because the leaves were found to contain 30% protein, the relatively small leaf dry matter yield difference translated into a noticeable leaf protein yield decline. As well, stem protein yield was reduced in direct proportion to the drop in stem dry matter yield incurred through the use of the PGR. The theory that the compaction of stems through the use of the product might have increased the concentration of protein in the stems was not borne out (Fig. 4). While the intended action of the PGR was to increase the total leaf yield of the crop, the actual use of the product instead resulted in a large stem yield reduction, and a slight leaf yield reduction. It is expected that further evaluation of the product will be made in 1988. Methods will be refined to further identify the effects of the compound.

CONCLUSIONS: Total dry matter and protein yields were reduced when the plant growth regulator was applied at any rate. The chemical led to the production of less leaf material and, particularly, less stem material in all treated plots. Protein yields of leaves and stems were correspondingly reduced. The PGR had no effect upon the actual protein contents of leaves and stems.

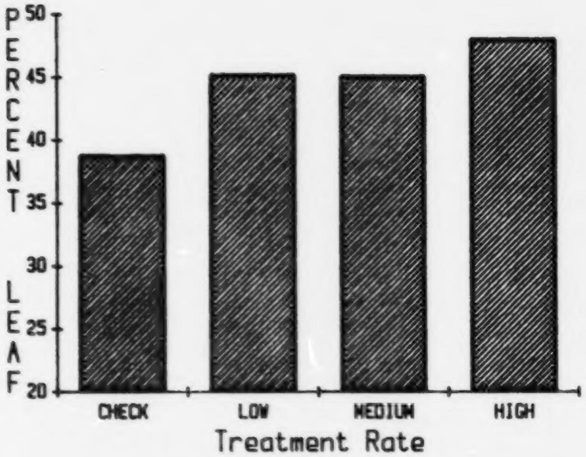


FIGURE 1 - LEAVES AS PERCENT OF TOTAL
DRY MATTER YIELD OF ALFALFA

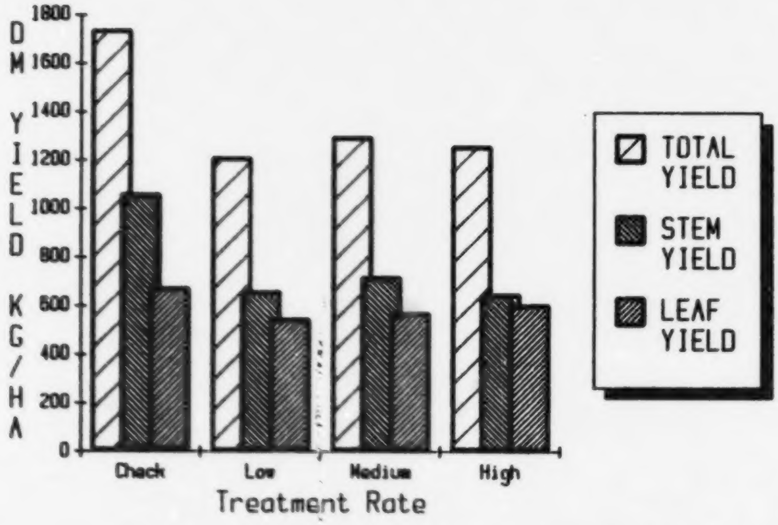


FIGURE 2 - LEAF, STEM AND TOTAL YIELDS
OF ALFALFA - KG / HA

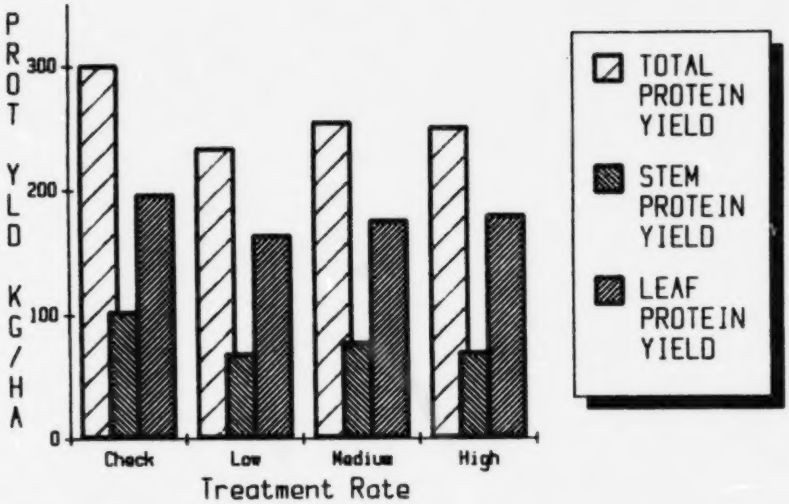


FIGURE 3 - LEAF, STEM AND TOTAL PROTEIN YIELDS OF ALFALFA - KG / HA

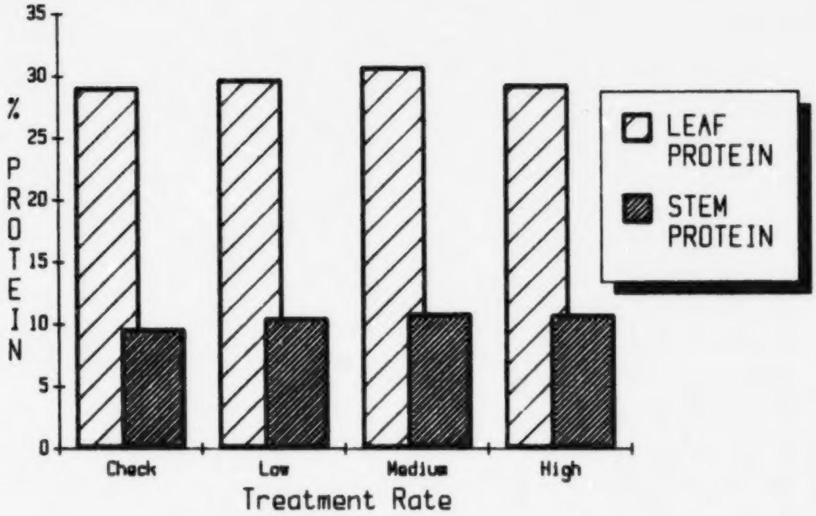


FIGURE 4 - PROTEIN CONTENTS OF LEAVES AND STEMS OF ALFALFA

MAX WHEAT GROWTH ANALYSIS

D.F. Walker and C.J. Duivenvoorden

Abstract: *A growth analysis was conducted on Max wheat to determine the N profile of the crop and its components, and to monitor parameters of physiological growth such as tillering, internodal length, plant height and total dry matter accumulation. Four samples, consisting of all above-ground plant material in a .5* m^2 *area, were collected weekly from a uniform stand from 20 May to harvest.*

The crop removed about 140 kg N/ha from the soil. Leaves and stems initially contained large amounts of nitrogen, but, upon heading of the crop, translocated most of it to the spike and eventually the kernels. Most absorption from the soil occurred between G.S. 21 (27 May) and G.S. 70 (15 July). The stand averaged 350 plants/m^2 *throughout the season. Up to 800 culms/*m^2 *were present after early tillering, but only 400 eventually produced heads. Dry matter accumulated almost steadily from the initial collection date, and eventually peaked at over 10 T/ha at G.S. 70. Internodes developed in succession, and a height of about 100 cm was eventually attained.*

ANALYSE DE CROISSANCE DU BLÉ MAX

Résumé : *Une analyse de la croissance du blé Max a été entreprise afin de déterminer le profil d'azote de ce blé et de ses éléments, et de mesurer divers paramètres physiologiques de croissance comme le tallage, la longueur des entrenoeuds, la hauteur des plants et l'accumulation totale de matière sèches. Du 20 mai à la date de récolte, on a recueilli hebdomadairement à partir d'un peuplement uniforme quatre échantillons comprenant toute la biomasse de surface sur une parcelle de 0,5 mètre carré.*

Les résultats démontrent que le blé a absorbé 140 kg à l'hectare d'azote du sol. Les feuilles et les tiges contenaient initialement de grandes quantités d'azote, mais lors de l'épiaison, la plus grande partie de cet azote s'est déplacé vers l'épi et, finalement, vers les grains. La période la plus *intensive d'absorption d'azote à partir du sol est survenue entre le stade de croissance 21 (le 27 mai) et le stade de croissance 70 (le 15 juillet). Pendant toute la saison, la densité moyenne du peuplement a été de 350 plants au^{2}m . On a compté jusqu'à 800 tiges potentielles au mètre carré après un tallage précoce, mais seules 400 de ces tiges ont effectivement produit des épis. L'accumulation de matières sèches s'est produite de façon presque constante à partir de la date de la première récolte pour atteindre un sommet à plus de 10 tonnes à l'hectare au stade de croissance 70. La croissance des entrenoeuds a progressé en stades successifs, de sorte que les plants ont finalement atteint une hauteur d'environ 100 cm.*

INTRODUCTION: The maximization of economic yields has taken on new significance with the development and expansion of the milling wheat industry in N.B. Because milling wheat is a product for which a premium price is paid, any yield reduction due to improper crop management translates into considerable income lost. Maintenance of the yield potential of a stand is dependent upon knowing week to week crop requirements and using available resources to best satisfy these needs. A knowledge of crop physiological parameters can supplement this information in the development of an integrated production plan.

This study was conducted on Max wheat in order to evaluate N requirements of the crop and to monitor translocation of N within the components of the plants. Physiological parameters such as plant density, plant height, internode length and dry matter production were also measured.

MATERIALS & METHODS: Max wheat was seeded into a conventionally prepared seedbed on 28 April at a rate of 350 viable kernels/m^2. A pre-plant application of 40 kg N/ha as urea was made, and was supplemented by a further 40 kg N/ha on both 29 May (G.S. 21) and 17 June (G.S. 37). Blagal (840 g ai/ha or 2.25 l product/ha) was used for weed control at G.S. 21. Tilt was applied at G.S. 31 at a rate of 125 g ai/ha (500 ml product/ha) for disease suppression. Upon emergence of the crop, 56 .5 m^2 plots were staked based on uniformity of stand. All above ground dry matter was collected from 4 plots weekly from 20 May to 19 August. The collected plants were counted, and tiller numbers, heights and internode lengths of a sub-sample of 10 plants were recorded. The plants were divided manually into leaf, stem and head components, and weighed. Upon drying, heads were threshed to kernels and chaff. Dry weights of all 4 crop components were recorded, and samples were analyzed for N content. The quantity of nitrogen contained in the crop and each of its components was calculated based upon the N content of each component and the proportion of total dry matter yield represented by each component.

RESULTS AND DISCUSSION: A stand count of about 350 plants/m^2 was maintained throughout the growth cycle of the wheat (Fig. 1). Tillering commenced soon after emergence, and reached a maximum level of 2.2 culms/plant or 807 culms/m^2 on 17 June (G.S. 37). Senescense of weaker tillers occurred until mid-July (G.S. 70-75), and a head population of about 400 was maintained from anthesis to harvest (Fig. 1). Dry matter accumulation was most rapid between 10 June (G.S. 31) and 15 July (G.S. 70-75), and peaked at over 10 T/ha 12 August (Fig. 2). Leaves were the predominant crop component in the early growth stages, but stems became the major crop constituent by mid-July. Non-kernel head components became measureable 01 July, and peaked at 2.8 T/ha 22 July. Except for an unexplained late surge in leaf dry matter, leaf, stem and non-kernel head dry matter yields declined toward late season with the onset of maturity. Concurrently, this collective decline was largely offset by an increase in kernel dry weight, indicating that a large translocation of plant material was occurring. The nitrogen profile of the crop components showed an even greater migration to the spike and kernels (Fig. 3). Leaves, stems and chaff, at various growth stages of the crop, each contained large amounts of N. However, with the onset of crop maturity, the nitrogen contained in each of these components appeared to move steadily into the grain. At harvest time more than 95 kg N/ha were contained in the kernels.

A plant height of 100 cm was maintained after G.S. 65 (Fig. 4). Internode development was successive and each of the 5 internodes was longer than its predecessor.

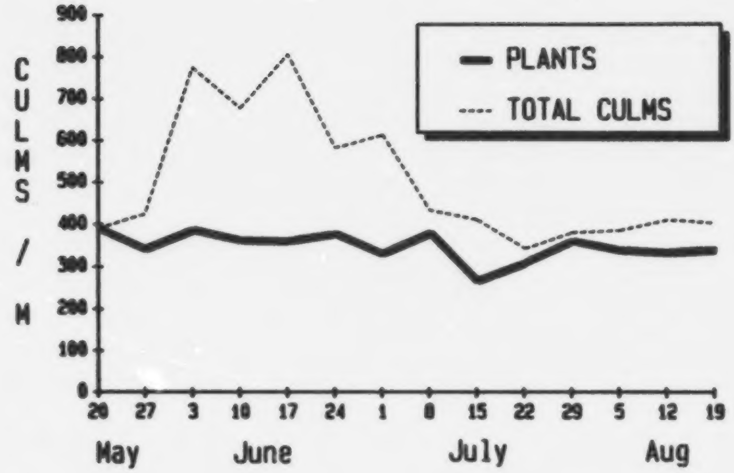


FIGURE 1 - MAX WHEAT GROWTH ANALYSIS
PLANTS AND TOTAL CULMS
PER METER SQUARED (1987)

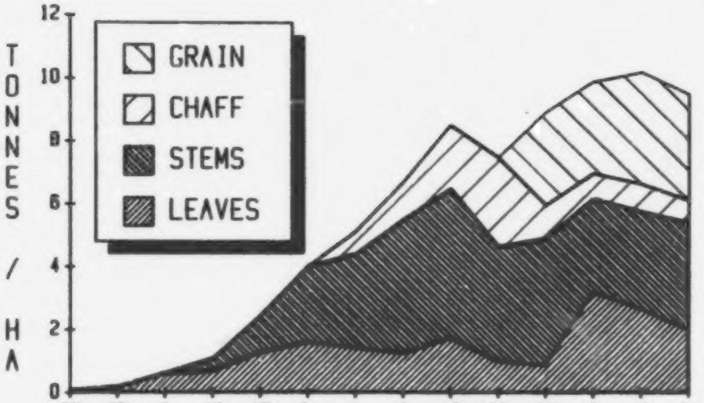


FIGURE 2 - MAX WHEAT GROWTH ANALYSIS
CONPONENT YIELDS PER
HECTARE - TONNES (1987)

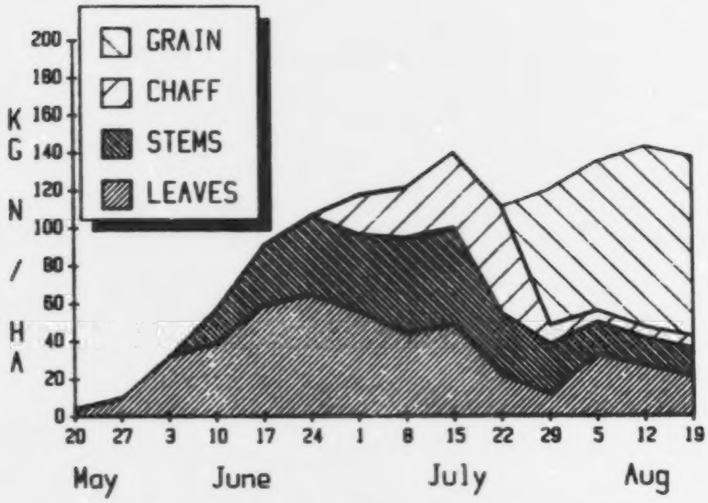


FIGURE 3 - MAX WHEAT GROWTH ANALYSIS COMPONENT N YIELDS PER HECTARE - KILOGRAMS (1987)

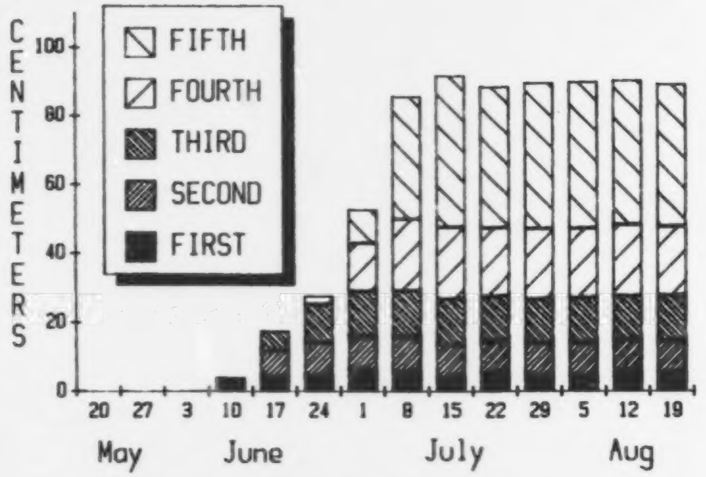


FIGURE 4 - MAX WHEAT GROWTH ANALYSIS INTERNODE LENGTHS - CENTIMETERS (1987)

CONCLUSIONS: The results of this study show that the total uptake of N by Max wheat exceeded currently recommended rates of fertilization. For the second year, the role of soil reserves in the successful production of a crop is demonstrated. Component monitoring and analysis show that both dry matter and nitrogen are translocated from senescing plant parts into kernels. The designation of peak periods of growth and N absorption will assist in preparing future protocols, and other data parameters collected will serve as useful benchmarks for extension.

REFERENCES: Walker, D.F. and Duivenvoorden, C.J. 1986. Max Wheat Growth Analysis. Adaptive Research Reports, N.B. Department of Agriculture. 8:142-147.

ACKNOWLEDGEMENTS: Thanks are extended to Gerald Springer for the provision of plot land.

Table 1 - Growth Stages of Max Wheat - 1987

Date	Zadoks Growth Stage
20 May	12
27 May	13
03 June	21
10 June	31
17 June	37
24 June	39
01 July	49
08 July	65
15 July	71
22 July	80
29 July	85
05 August	87
12 August	90
19 August	92

MAX WHEAT PGR STUDY

C.J. Duivenvoorden and D.F. Walker

Abstract: *Seven PGR treatments were applied to plots of Max wheat to determine the anti-lodging effectiveness of each and to evaluate possible yield or grading side effects. Max wheat was seeded 28 April at a rate of 300 viable kernels/m*^{2} *into a RCB design. Forty kg N/ha were applied as urea 28 April (preplanting), 29 May (G.S. 23) and 17 June (G.S. 37), and Blagal (840 gai/ha or 2.25 l product/ha) at G.S. 21 was used for weed control.*

All PGR treatments significantly reduced plant height, but no lodging was observed in any plot. Kernel weights were constant over all treatments, and yields were neither enhanced nor reduced by any PGR combinations. Grades varied from No 1 CEHRS to No. 3 CEHRS, but did not appear to be linked to treatment.

ÉTUDE DU TRAITEMENT AU RCP SUR LE BLÉ MAX

Résumé : *Sept traitements au RCP ont été appliqués à des parcelles de blé Max afin d'établir l'efficacité de chacun de ces traitements contre la verse et afin d'évaluer les effets secondaires possibles sur le rendement ou le classement. Du blé Max a été semé le 28 avril à raison de 300 grains viables au mètre carré dans un dispositif expérimental en blocs divisés au hasard. Quarante kilos d'azote à l'hectare ont été appliqués sous forme d'urée le 28 avril (avant l'ensemencement), le 29 mai (stade de croissance 23) et le 17 juin (stade de croissance 37). En outre, du Blagal (840 g ai/ha ou 2,25 l produit/ha) a été appliqué au stade de croissance 21 afin de lutter contre les mauvaises herbes.*

Tous les traitements RCP ont réduit de façon significative la hauteur des plants, mais on n'a pas non plus décelé de verse dans aucune parcelle. Le poids des grains était constant peu importe le type de traitement et les rendements n'ont pas été améliorés ni réduits, quelle que soit la combinaison de RCP. Les catégories variaient de CEHRS n° 1 à CEHRS n° 3 mais les traitements n'ont pas semblé influer sur ce dernier facteur.

INTRODUCTION: The milling wheat market has become increasingly attractive to N.B. producers because of the premium price paid. While feed wheat provided farmers a return of only $75/T in 1987, milling wheat was trading for $270/T. The production of Max, the only milling cultivar currently recommended, requires considerable financial investment for crop protection. Max is not very susceptible to lodging, but the use of PGRs may be warranted to insure the crop against periodic lodging-induced downgrading. Most growth regulators are relatively inexpensive, and may be tank mixed with fungicides or herbicides to save application costs. However, the effects of PGRs upon yield and kernel quality of wheat must be evaluated before positive recommendations can be made. Concerns have been raised that some products may cause floret sterility or even lead to the development of late green tillers.

This study was conducted to determine the effects of seven PGR treatments upon yields and grading characteristics of Max wheat.

MATERIALS AND METHODS: Max wheat was seeded 28 April into a prepared seedbed at a rate of 300 viable kernels/m^2. An 8 treatment, 4 replicate randomized complete block design was staked upon emergence. Plots were 8.5 x 3 m to allow for a 2 m sprayer boom plus a guard row between treatments. In addition to 40 kg N/ha applied as urea at planting, the plots received 40 kg N/ha on 29 May (G.S. 23) and 17 June. Blagal was applied as a blanket at G.S. 21 for weed control, and Tilt was applied at G.S. 31. The treatment protocol is given in Table 1 and a CO_2 wand sprayer was used for all spraying. The spray volume was 500 l/Ha at a pressure of 20 psi. The plots were harvested 21 August with a small plot combine.

RESULTS AND DISCUSSION: Plant heights were significantly decreased by all 7 PGR treatments (Table 1). The combination of Citowett Plus and Terpal C (345 gai/ha) at G.S. 37 was most effective, reducing crop height by 34 cm. Lodging did not occur in any plot. No detrimental effects due to PGR application were indicated in this study. Grades of samples ranged from No. 1 CEHRS to No. 3 CEHRS, but did not appear to be linked to either treatment rate

TABLE 1 - Height, Yield, TKW and Grade of Max Wheat PGR Treatments Hartland, 1987.

Treatment Product	Rate[1]	Stage of Appl.	Plant Height cm	Yield T/ha	TKW grams	GRADE
Check	-	---	111	4.4	39.3	No 1 CEHRS
Cerone	240	38-45	93	4.3	39.4	No 1 CEHRS
Cycocel	230	23-31	90	4.5	40.6	No 3 CEHRS
Cycocel[2]	140	23-31	87	4.4	39.6	No 3 CEHRS
Cycocel[2]	345	23-31	84	4.5	40.1	No 3 CEHRS
Terpal C[2]	345	38-45	83	4.3	38.5	No 2 CEHRS
Cycocel[2]	230	23-31	82	4.3	38.1	No 1 CEHRS
Terpal C[2]	345	32-37	77	4.5	40.8	No 2 CEHRS
LSD.05			7.4	N.S.		

[1]- grams active ingredient per hectare

[2]- plus Citowett Plus at .05% V/V

or application timing. The average yield of all plots was 4.4 T/ha, and treatment means ranged from 4.3 to 4.5 T/ha. Thousand kernel weights were similarly unaffected by any treatment, and ranged from 38.1 to 40.8 g. The 1987 growing season did not stress the crop, and thus neither floret infertility nor late tillering were observed. It would appear that the choice of a PGR may be based upon cost and convenience of application.

CONCLUSIONS: All PGR treatments significantly reduced the height of Max wheat, but no lodging occurred in any plot. Yield, grade and thousand kernel weight were unaffected by any treatment, and no evidence was seen of late tillering or floret infertility.

ACKNOWLEDGEMENTS: The authors express thanks for the use of plot land to Gerald Springer.

MAX WHEAT FERTILITY STUDY

D.F. Walker and C.J. Duivenvoorden

***Abstract**: This study was conducted to evaluate the effects of N fertility level and N source on the yield and quality characteristics of Max milling wheat. Seeding took place 28 April, and a rate of 300 viable kernels/m^2 was used. Four levels of N fertility, 60, 90, 120 and 150 kg/ha, and 2 sources, ammonium nitrate and urea, were compared in a RCB design with a split over N source. The first application of N, 60 kg/ha, took place 07 May at G.S. 11, and the remainder was applied 03 June at G.S. 21. No yield differences were apparent between levels of N, but plots receiving ammonium nitrate yielded more than plots receiving urea. Protein levels of grain increased an average of 3.0 % as fertility level increased from 60 to 150 kg N/ha. No lodging or disease effects were seen.*

ÉTUDE DE FERTILITÉ DU BLÉ MAX

***Résumé** : Cette étude a été effectuée afin d'évaluer les effets du niveau et des sources d'azote sur le rendement et la qualité du blé de mouture Max. L'ensemencement a eu lieu le 28 avril à raison de 300 grains viables au mètre carré. Quatre niveaux d'azote (60 kg, 90 kg, 120 kg et 150 kg à l'hectare) et deux sources d'azote (nitrate d'ammonium et urée) ont été comparés dans un dispositif expérimental en blocs divisés au hasard qui a été répété quatre fois. La première application d'azote, 60 kg à l'hectare a eu lieu le 7 mai au stade de croissance 11 et le reste a été appliqué le 3 juin au stade de croissance 21. Aucune différence de rendement n'est apparue entre les différents niveaux de traitement, mais les parcelles qui ont reçu du nitrate d'ammonium ont donné un rendement supérieur aux parcelles qui ont reçu de l'urée. Le niveau de protéines dans les grains a augmenté en moyenne de 3 % quand le niveau de fertilisation a augmenté de 60 kg à 150 kg d'azote à l'hectare. On a constaté aucune verse ni aucune maladie.*

INTRODUCTION: Max wheat production involves a considerable producer investment. The price of milling wheat is more than twice that of feed wheat, but the cost of added inputs for crop nutrition and protection are significant, and results are not guaranteed. Disease control is required to prevent downgrading due to kernel size and color, and fertility applications are necessary to ensure the attainment of acceptable grain protein levels. While fungicidal costs are predetermined from a producer point of view, both the source and level of nitrogen fertility applied can affect the production cost of the crop. Urea is normally less expensive than ammonium nitrate and is more concentrated, reducing handling costs. It is of benefit to the producer to know how fertility costs may be reduced without jeopardizing kernel quality.

This study was undertaken to determine the effects of nitrogen source upon yields and quality characteristics of Max wheat, and to determine N levels at which the attainment of milling grade may be assured.

MATERIALS AND METHODS: Max wheat was seeded into a prepared seedbed 28 April at Hartland. A rate of 300 viable seeds/m^2 was used. A 4 replicate randomized complete block design with 8 plots/rep was prepared to allow for comparison between 2 nitrogen sources, ammonium nitrate and urea, at each of 4 rates, 60, 90, 120 and 150 kg/ha. Four by 8.5 m plots were staked out upon emergence of the wheat, and an initial application of 60 kg N/ha was given to all plots at G.S. 11 (07 May). The remaining N was applied by hand at G.S. 21 (03 June). Blanket applications of Blagal (840 gai/ha or 2.25 l product/ha) at G.S. 21 and Cycocel (144 gai/ha or .3 l product/ha) at G.S. 30 were made for weed control and lodging protection. Harvest with a small plot combine took place 21 August.

RESULT & DISCUSSION: Factorial analysis revealed that yields were not affected by the different rates of N fertility applied (Table 1). Treatment level means ranged from 4.7 T/ha for the 90 kg N/ha level to 4.6 T/ha for the 150 kg N/ha treatment, indicating that residual nitrogen levels were high. However, increasing the level of applied N was effective in increasing grain protein (Table 2). Because pooled samples were used, statistical analysis of data was not possible, but lab results show an average increase of 3.0 % protein as fertility was increased from 60 to 150 kg N/ha. Plots receiving ammonium nitrate yielded an average of 185 kg/ha more than those receiving urea (Table 3). Component analysis shows that the urea plots produced fewer heads/m^2

Table 1 - Max Wheat Fertility Study Summary Table

	Yield	TKW	Head Count	Kernels /Head	Septoria Rating
Replication	N.S.	N.S.	* *	N.S.	N.S.
Nitrogen Source	*	N.S.	* *	N.S.	N.S.
Fertility Level	N.S.	N.S.	N.S.	N.S.	N.S.
Nitrogen Source Fertility Level	N.S.	N.S.	N.S.	N.S.	N.S.

Table 2 - Yield and Agronomic Data of Max Wheat as Affected by Fertility Treatments

Treatment		Yield	Heads	Protein
N Source	Fert. Level*	T/ha	/m^2	Content
Am. Nit.	60	4.7	427	15.3
Am. Nit.	90	4.8	444	16.3
Am. Nit.	120	4.7	440	18.1
Am. Nit.	150	4.7	428	18.4
Urea	60	4.6	399	15.9
Urea	90	4.7	434	15.0
Urea	120	4.5	384	17.2
Urea	150	4.4	410	18.8
		N.S.	N.S.	

* - kg N/ha

Table 3 - Yield and Head Populations of Max Wheat as Affected by Nitrogen Source

N Source	Yield T/ha	Heads m^2
Ammonium Nitrate	4.74	435
Urea	4.55	407

than the ammonium nitrate plots. Since other yield components were similar across all levels of both treatments, this reduction in head population appears to be responsible for the yield trend. Urea may have caused the head population to decline through either a toxic effect or delayed availability of N at the critical tillering period. Farmer claims of negative side effects of urea may have been demonstrated in this study, but cannot be positively legitimized without further experimentation. Lodging was not a factor, even at high levels of fertility. Similarly, disease ratings showed no discrepancies between treatments.

CONCLUSION: No yield differences resulted from increasing nitrogen applications from 60 to 150 kg N/ha, but an average increase of 3.0 % in grain protein was seen across the same range. The level of residual nitrogen plus the lowest level in the study was obviously high enough to ensure that nitrogen was not a yield limiting factor. Plots receiving ammonium nitrate produced more heads per meter squared and subsequently higher yields than plots receiving urea. Lodging and disease effects due to treatment were not evident in this study.

ACKNOWLEDGEMENTS: The authors thank Gerald Springer for providing plot land for this study.

MAX WHEAT SEEDING DATE/RATE STUDY

D.F. Walker & C.J. Duivenvoorden

Abstract: Max Wheat was seeded at 6 rates, from 100 to 600 viable kernels / m^2 on each of 3 dates, 28 April, 14 May and 27 May, in order to determine the effects of seeding date and seeding rate upon yield and yield components. A 4 replicate RCB design with a split over seeding date was used. All plots received 40 kg N/ha at seeding and 40 kg N/ha as Urea on both 29 May and 17 June. Blagal at a rate of 840 gai/ha (2.25 l product/ha) was applied at G.S. 21 for weed control.

Grain yields declined consistently as seeding date was delayed. Yields increased with seeding rate only in later seeded plots, indicating an interactive effect. Thousand kernel weights declined as seeding date was delayed and as seeding rates were increased. Head counts were directly proportional to seeding rates within seeding dates, but declined across all seeding rates at the later seeding dates. The number of kernels per head decreased as seeding density increased. No lodging was observed.

ÉTUDE SUR LES DATES ET LES TAUX D'ENSEMENCEMENT DU BLÉ MAX

Résumé : Du blé Max a été semé à raison de six taux d'ensemencement allant de 100 à 600 grains viables au mètre carré à chacune des trois dates suivantes : le 28 avril, le 14 mai et le 27 mai. Le but était d'établir les effets de la date et du taux d'ensemencement sur le rendement et sur les éléments du rendement. Un dispositif expérimental en blocs divisés au hasard qui a été répété quatre fois et qui était divisé en fonction des dates d'ensemencement a été utilisé. Toutes les parcelles ont reçu 40 kg d'azote à l'hectare au moment de l'ensemencement et 40 kg d'azote à l'hectare sous forme d'urée le 29 mai et le 17 juin. Du Blagal à raison de 840 gai/ha (2,25 l produit/ha) a été appliqué au stade de croissance 21 afin de lutter contre les mauvaises herbes.

Plus l'ensemencement était tardif, plus le rendement en grains déclinait. Le rendement n'a augmenté avec le taux d'ensemencement que sur les parcelles où l'ensemencement avait été tardif indiquant qu'il y a là un effet interactif. Plus l'ensemencement a été tardif et les taux d'ensemencement importants, plus le poids par mille grains a diminué. Par ailleurs, plus l'ensemencement a été hâtif, plus le nombre d'épis a été directement proportionnel aux taux d'ensemencement; plus l'ensemencement a été tardif, plus le nombre d'épis a chuté. Plus la densité des plants était forte plus le nombre de grains par épi était faible. On n'a observé aucune verse.

INTRODUCTION: Max wheat, the first milling wheat to become available to N.B. grain producers, may provide a much-needed boost to the local industry. The low grain prices of the past 3 years continue to plague markets, and relief is not immediately in sight. Downward pressure on feed prices has been maintained by stable yields and a world surplus of grain. Milling wheat prices have also been depressed, but domestically have been set at a level of $257./T, more than twice those of feed wheat. A confirmed market exists in Halifax for locally grown Max.

The strict quality requirements for milling wheat necessitate a higher level of management. Diseases must be controlled and adequate fertility must be provided if proper kernel characteristics are to be attained. Additionally, the effects of seeding date and seeding rate, though initially investigated (Walker and Duivenvoorden, 1986), have yet to be verified.

This study was conducted to determine the effects of seeding date and seeding rate upon yield, yield components and milling characteristics of Max wheat.

MATERIALS & METHODS: Max wheat was seeded into a conventionally prepared and rolled seedbed on each of 3 dates, 28 April, 14 May and 27 May. Six seeding rates were used on each date, from 100 to 600 viable kernels/m^2 in increments of 100. A row spacing of 12 cm and a seeding depth of 1.5-2.0 cm were used. The study was a randomized complete block design, with a split over seeding date, and was replicated 4 times. An application of 40 kg N/ha was applied at seeding, and was supplemented by 40 kg N/ha on both 29 May and 17 June. All fertility applications were in the form of urea. At G.S. 21, all plots received Cycocel at 143 gai/ha (.31 l product/ha) and Blagal at 840 gai/ha (2.25 l product/ha) for weed control. Harvest of the crop took place on 21 August, 26 August and 8 September using a small plot combine.

RESULTS & DISCUSSION: A yield interaction was found between seeding date and seeding rate (Fig. 1), verifying previous findings (Walker and Duivenvoorden, 1986). Yield drops of over 2 T/ha were incurred as seeding date was delayed from 28 April to 27 May. Concurrently, yield increases due to higher seeding rates became increasingly evident in late seedings. The yield compensatory mechanisms of the wheat plant appear better able to overcome large seeding rate differences if seeding occurs early in the season. Yields did increase across seeding rates in the 27 May seeding, but compensation was not adequate to recoup losses incurred by the seeding delay.

Compensation, which occurs through changes in kernel size and/or kernel number, could not be clearly attributed to any one component of yield. Both thousand kernel weight and kernel number/m^2 declined as seeding date was delayed (Fig. 2, Fig. 3). Reduced plant vigor due to hastened early growth and a shortened life cycle have been suggested as explanations for these trends (Walker and Duivenvoorden, 1986). TKW reductions occurred as seeding rate was increased, probably because of increased disease pressure in a denser canopy and interplant competition for light, water and fertility. Kernel number/m^2 increased with seeding rate in all three seeding dates, parallelling yield trends particularly in the last date.

The increased number of heads produced at higher seeding rates (Fig. 4) were offset to a great extent by much larger heads produced at lower seeding rates (Fig. 5), explaining much of the lack of response to seeding rate in the first 2 dates. Because of a hastened growth cycle, in the third date the lower seeding rates had a reduced tillering ratio, and, consequently, a lower head population and reduced yield. The lower tillering ratio was not a factor at higher seeding rates, because higher plant populations precluded the need for tillering. Increased head populations explain yield response to seeding rate.

The strong straw of Max prevented the occurrence of any lodging.

CONCLUSION: Yields of Max wheat were highest when seeding was done early. Some of the losses associated with late seeding were offset by an increase in seeding rate. Both kernel size and kernel number reductions were responsible for the yield trends observed between dates. Kernel size was reduced as seeding rate increased. Heads were larger at low seeding rates, but head populations were proportional to seeding rates. Lodging did not occur in any plots.

REFERENCES: Walker, D.F. and Duivenvoorden, C.J. 1986. Belvedere Wheat Seeding Date/Rate Study. Adaptive Research Reports, N.B. Dept. of Agriculture. 8:125-129.

ACKNOWLEDGEMENTS: The authors extend thanks to Gerald Springer for providing land for this study.

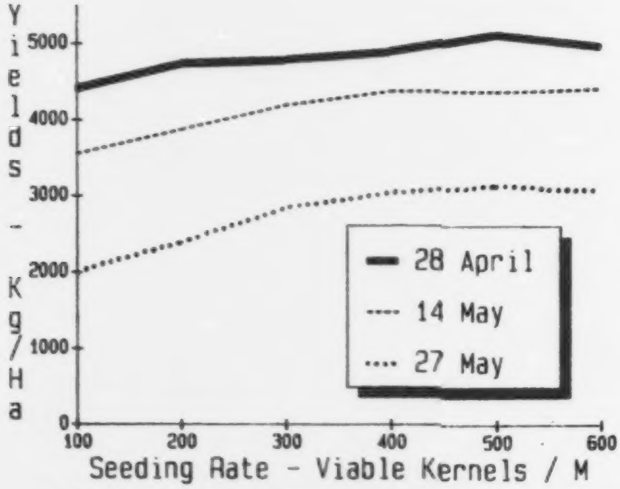


FIGURE 1 - EFFECTS OF SEEDING DATE AND SEEDING RATE ON YIELDS OF MAX WHEAT (1987)

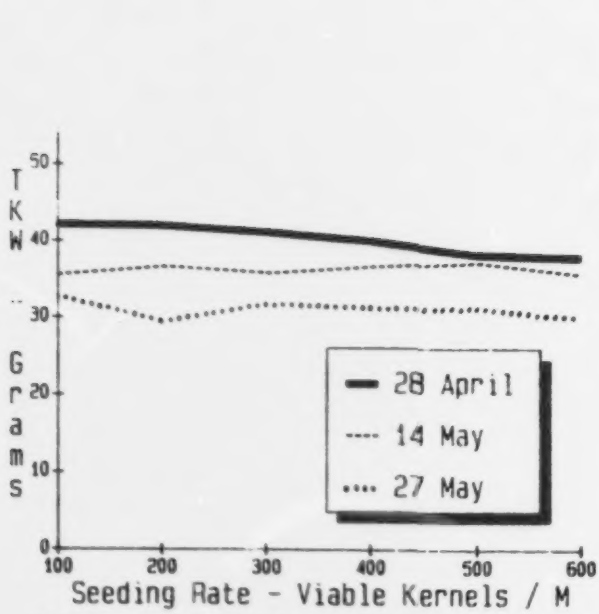


FIGURE 2 - EFFECTS OF SEEDING DATE AND SEEDING RATE ON TKW OF MAX WHEAT (1987)

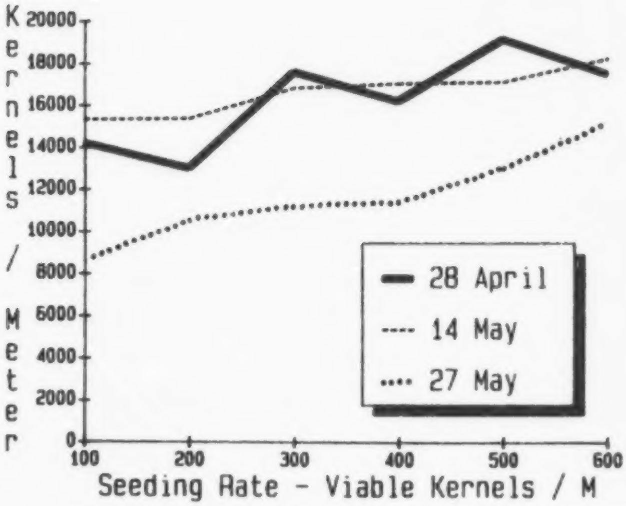


FIGURE 3 - EFFECTS OF SEEDING DATE AND SEEDING RATE ON KERNELS PER METER OF MAX WHEAT (1987)

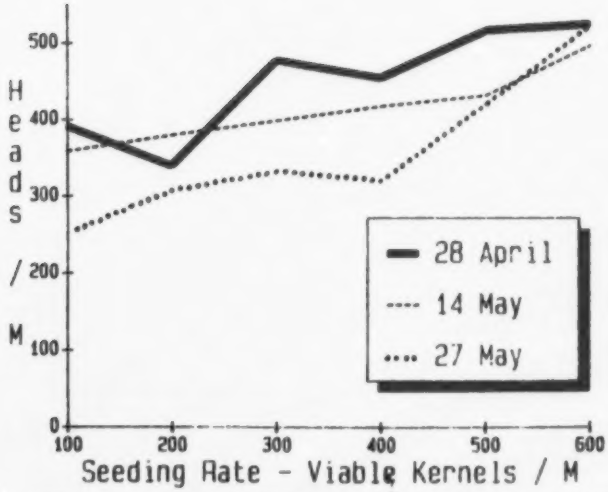


FIGURE 4 - EFFECTS OF SEEDING DATE AND SEEDING RATE ON HEAD COUNTS OF MAX WHEAT (1987)

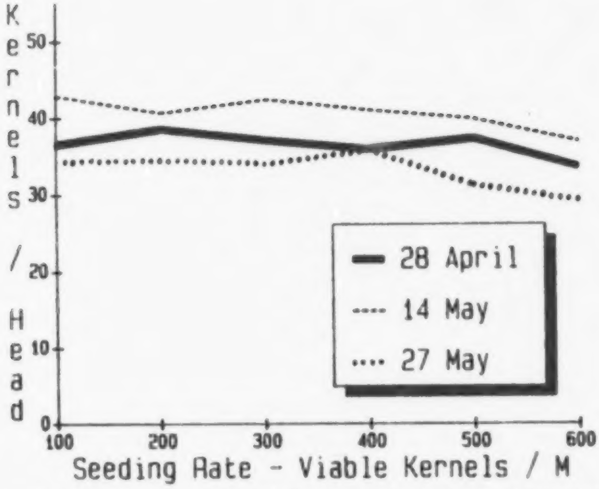


FIGURE 5 - EFFECTS OF SEEDING DATE AND SEEDING RATE ON KERNELS PER HEAD OF MAX WHEAT (1987)

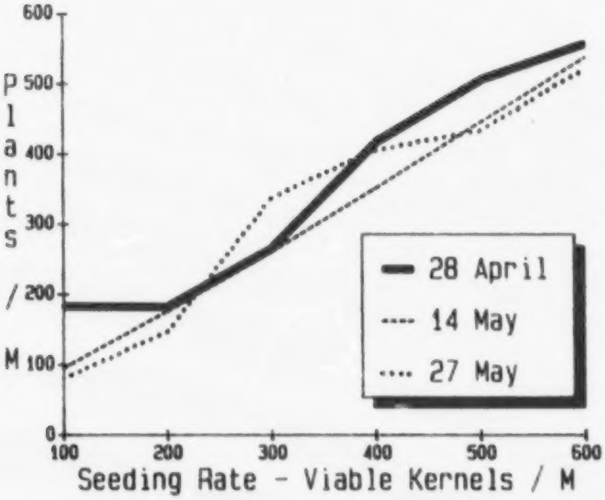


FIGURE 6 - EFFECTS OF SEEDING DATE AND SEEDING RATE ON PLANT POPULATIONS OF MAX WHEAT (1987)

SPRING WHEAT CULTIVAR EVALUATION TRIAL

C.J. Duivenvoorden and D.F. Walker

Abstract: *The performance of 11 cultivars of spring wheat and triticale was evaluated in a 4 replicate RCB design. The plots were seeded 28 April at a rate of 300 viable kernels/*m^2*, and received 40 kg N/ha at seeding and again at G.S. 23. Blagal (840 gai/ha or 2.25 l product/ha) was used for weed control, and an application of Cycocel (144 gai/ha or .3 l product/ha) was made at G.S. 30.*

CT3, AW117 and Belvedere were the highest yielding cultivars, producing 4.6, 4.5 and 4.4 T/ha respectively. The three milling wheats had the lowest yields, averaging 3.5 T/ha. CT3 and Messier produced the largest kernels, and Beaguelita had the most kernels per head. Katepwa and Columbus, the Western milling cultivars, produced more heads/m^2 *but these contained the fewest number of kernels. No significant lodging occurred in any of the plots.*

ESSAI D'ÉVALUATION DE CULTIVARS DE BLÉ DE PRINTEMPS

Résumé : *Le rendement de onze cultivars de blé de printemps et de triticale a fait l'objet d'une évaluation dans un dispositif expérimental en blocs divisés au hasard que l'on a répété quatre fois. Les parcelles ont été ensemencées le 28 avril à un taux de 300 grains viables au mètre carré et ont reçu 40 kg d'azote à l'hectare au moment de l'ensemencement, suivi d'une autre application équivalente au stade de croissance 23. On a utilisé à titre de désherbant du Blagal (840 g ai/ha ou 2,25 l produit/ha) et on a procédé à une application de Cycocel (144 g ai/ha ou 0,3 l produit/ha) au stade de croissance 30.*

Les variétés CT3, AW117 et Belvedere ont été celles qui ont donné le plus haut rendement, produisant respectivement 4,6, 4,5 et 4,4 tonnes à l'hectare. Les trois blés de mouture ont eu les rendements les moins importants avec une moyenne de 3,5 tonnes à l'hectare. Les variétés CT3 et Messier ont produit le plus grand nombre de grains et la variété Beaguelita était celle qui comportait le plus de grains par épi. Les variétés Katepwa et Columbus, les cultivars de blé de mouture de l'Ouest, ont produit plus d'épis au mètre carré, mais ces épis étaient ceux qui comptaient le moins de grains. Aucune parcelle n'a été atteinte de façon significative par la verse.

INTRODUCTION: Wheat continues to be a major N.B. crop. It occupies approximately 20% of the province's total cereal acreage, and returns a better price than barley. It will tolerate moderate soil pH levels, and is less sensitive to imperfect soil drainage than all cereals but oats. Well adapted cultivars have been available for some time, but plant breeders are still concentrating on improved performance. Milton and Opal have been mainstays in past years, but are now being eclipsed by Belvedere. New cultivars of triticale, a wheat-like feed crop with wheat and rye parentage, are producing yields rivalling the best wheats. As well, a new dimension has been added to the cereals industry in 1987 with the initiation of commercial milling wheat production. Max is the only cultivar currently recommended, but Western wheats such as Columbus and Katepwa are being evaluated.

This study was undertaken to assess the performance of 3 milling wheats, 2 triticales and 6 feed wheats.

Table 1: Yield and Agronomic Data of Spring Wheat and Triticale Cultivars - Hartland, 1987.

Cultivar	Yield T/ha	Heads /m^2	Kernels /Head	TKW grams
CT3	4.6	302	35.2	53.8
AW117	4.5	387	37.7	39.8
Belvedere	4.4	408	37.6	40.2
Beaguelita	4.3	358	39.5	42.1
Messier	4.3	409	35.9	45.2
AW110	4.2	309	36.0	40.8
Cal 79-373	4.1	451	33.4	40.5
Milton	3.9	316	35.1	41.1
Max	3.7	403	30.2	41.2
Katepwa	3.5	566	24.8	36.9
Columbus	3.4	500	26.4	41.3
LSD.05	.3	56	5.3	1.8

MATERIALS AND METHODS: Six feed wheats, 3 milling wheats and 2 triticales were sown 28 April into a prepared seedbed. The experiment was a randomized complete block design with 4 replications and a seeding rate of 300 viable kernels/m^2 . Forty kg N/ha were applied both at seeding and at G.S. 23.

Blagal (840 gai/ha or 2.25 l product/ha) was applied at G.S. 21 for weed control, and an application of Cycocel (145 gai/ha or .3 l product/ha) was made at G.S. 30. All plots were harvested 21 August with a small plot combine.

RESULTS AND DISCUSSION: The 1987 growing season was characterized by favorable conditions for early seeding and above average levels of sunshine. Most commercial cereal crops in the Saint John River Valley had been seeded by mid-May, and, physiologically, were about 2 weeks ahead of 1986 crops throughout the summer. Disease pressure was very low until early August, and precipitation was generally well-timed and adequate.

For the second year, CT3 was the highest yielding cultivar of the trial. It had the lowest head population of the study, but produced very large kernels which more than compensated. Both CT3 and Beaguelita, the other triticale, have performed well in small plot evaluation. Beaguelita is currently on the recommended list, and will probably be joined by CT3 in 1990. Several farmers in N.B. have grown triticale, and production should increase as more farmers recognize the yield potential of the crop. Of the feed wheats, Belvedere and AW117 produced the highest yield, about 4.5 T/ha. Both cultivars had large heads, average head populations and relatively low kernel weights. Both are lines from the Charlottetown program, but AW117 will probably not be released because of its similarity to Belvedere. Messier and AW110 each produced 4.2 T/ha, slightly above the mean of the study. All feed wheats outyielded the milling cultivars. Max was the highest yielding milling wheat, with 3.7 T/ha. Both Columbus and Katepwa, bred for dry Western climates, produced large numbers of heads with relatively fewer kernels. Katepwa produced the smallest kernels, but still attained a grade of No1 CE HRS. Extra N fertility might have enhanced grain protein, since nitrogen fertility levels for this study were below those recommended for commercial milling wheat production. No lodging occurred in any of the plots.

CONCLUSIONS: CT3 and Beaguelita triticales continue to produce yields comparable to the best feed wheats and Beaguelita will probably see expanded production in 1989. CT3 registration is pending. AW117, Belvedere, Messier and AW110 were, in descending order, the highest yielding feed wheats. Commercial production of Belvedere should increase in 1989 as seed becomes more readily available. The three milling wheats were outyielded by all other cultivars evaluated, but all were graded No1 CE HRS or better. Katepwa in particular will be the subject of extensive management studies in 1989.

ACKNOWLEDGEMENTS: Thanks are extended by the authors to Gerald Springer for the provision of plot land.

OAT CULTIVAR EVALUATION TRIAL

C.J. Duivenvoorden, D.F. Walker, B.A. Bamford

Abstract: *Nine oat cultivars, including 2 hull-less, were seeded in a 4 replicate RCB design on 28 April at Hartland. Forty kg N/ha were applied at seeding and again on 29 May, at G.S. 23.*

The highest yielding line was Q0217-33 with 4.5 T/ha. The lowest yielding conventional oat was Q0220-45 with 4.0 T/ha. The two hull-less cultivars, Tibor and 03669, yielded 3.2 and 3.0 T/ha respectively. All cultivars lodged severely. Thousand kernel weights ranged from 39.4 g for Marion to 31.5 g for Shaw.

ESSAI D'ÉVALUATION DE CULTIVARS D'AVOINE

***Résumé** : Neuf cultivars d'avoine, y compris deux cultivars à grain nu, ont été semés le 24 avril à Hartland dans un dispositif expérimental en blocs divisés au hasard qui a été répété quatre fois. On a appliqué 40 kg d'azote à l'hectare en procédant aux semences, puis on a répété l'application le 29 mai au stade de croissance 23.*

La ligne au rendement le plus élevé a été la ligne de cultivars Q0217-33 avec un rendement de 4,5 tonnes à l'hectare. L'avoine conventionnelle ayant eu le rendement le moins important a été l'avoine Q0220-45 avec un rendement de 4,0 tonnes à l'hectare. Les deux cultivars d'avoine à grain nu, le Tibor et le 03669, ont donné un rendement respectif de 3,2 et de 3,0 tonnes à l'hectare. Tous les cultivars ont été gravement atteints par la verse. Le poids par mille grains allait de 39,4 g pour l'avoine Marion à 31,5 g pour la variété Shaw.

INTRODUCTION: Oats continues to be the most widely grown cereal in New Brunswick, occupying approximately 45% of all grain hectareage in 1987. It yields the least of all cereal crops and is difficult to market when late-harvested, but appeals to many small scale farmers because of its versatility. It requires little fertility, and can be grown in soils too acidic for production of wheat or barley. It will tolerate poor drainage conditions, and is largely resistent to yield-threatening diseases. The prolonged harvest period of oats is especially advantageous to small scale farmers, who frequently work within the harvest scheduling limitations of custom operators. The development of new higher yielding oat cultivars continues, but has been slowed recently as a result of budgetary cutbacks. Concurrently, interest in hull-less oats has intensified. Hull-less oats retain the desirable agronomic characteristics of conventional oats and should be more readily marketable. Hulls are released during the threshing operation, and the resulting naked kernels represent a condensed, high quality livestock feed. Plant breeding efforts are underway to make hull-less oats more commercially feasible, as yields of the best cultivar, Tibor, now average only 70-75% of those of leading hulled cultivars.

This study was initiated in order to evaluate yield and yield affecting parameters of 7 conventional oat cultivars and 2 hull-less oats.

MATERIALS & METHODS: Nine oat cultivars were seeded on 28 April at Hartland in a RCB design with 4 replications. Each 2 x 8.5 m plot was seeded at a rate of 300 viable kernels/m^2 using a Wintersteiger small plot drill with a 12 cm row spacing. All plots received 40 kg N/ha at seeding and again on 29 May, at G.S. 23. All plots received Cycocel (575 gai/ha or 1.25 l product/ha) at G.S. 30 on 03 June. All plots were harvested 20 September with a small plot combine.

RESULTS & DISCUSSION: The highest yielding cultivar was Q0217.33, producing 4.48 T/ha. Five other hulled cultivars produced in excess of 4 T/ha (Table 1). Tibor and 03669, the two hull-less oats, produced 3.20 and 2.96 T/ha respectively, approximately 75% of the mean of hulled cultivars. The poor performance of 03669 can be explained to some degree by the fact that an initial seed shortage necessitated the use of a lower-than-recommended seeding rate. Examination of cultivar yield components failed to conclusively explain yield trends. Tibor and Marion, both below the median of the test, produced the largest kernels, and the kernels of Nova were among the smallest. The high kernel weight of Tibor is further evidence that some factor other than the reduced size of naked kernels is responsible for the yield differential between hull-less and hulled cultivars. Floret infertility has been suggested, and was noted in previous work (Walker & Duivenvoorden, 1986). Kernel number per head of all cultivars corresponded roughly to yield, but did not correlate strongly. No significant head count differences were found between cultivars. Lodging occurred early, and measurable differences were evident by August. Tibor, Q0217-33 and Q0220-45 consistently lodged less than other cultivars and, conversely, Sentinel and Q0214-16 lodged most.

CONCLUSION: For the second year, the top yielding oat cultivars were Q0217-33, Q0214-16 and Nova. Of these, the former was most resistant to lodging. Hull-less cultivars again produced only 75% of the mean yield of hulled cultivars. The large kernel size of Tibor pointed to some factor beyond kernel size accounting for the large yield differential observed.

ACKNOWLEDGEMENTS: The authors express thanks for the use of plot land to Gerald Springer.

Table 1 Yield and Agronomic Data of Oat Cultivars-Hartland, 1987

Cultivar	Yield T/ha	TKW grams	Lodging 5 Aug.	Rating Harvest	Kernels /Head	Heads /m^2
Q0217-33	4.5	35.9	1.4	6.4	52.0	388
Q0214-16	4.3	37.6	3.7	7.9	60.4	325
Nova	4.2	32.8	2.2	7.7	63.0	311
Shaw	4.2	31.6	3.2	7.2	56.3	368
Sentinel	4.1	35.0	5.6	8.8	50.1	329
Marion	4.1	39.4	2.3	7.0	42.7	425
Q0220-45	4.0	34.5	2.0	5.1	42.6	336
Tibor*	3.2	38.1	1.3	6.5	40.0	353
03669*	3.0	33.7	3.3	7.1	43.0	360
LSD.05	.4	3.6	2.3	1.3	12.0	N.S.

*hull-less

TIBOR OATS PGR STUDY

C.J. Duivenvoorden and D.F. Walker

Abstract: *Ten PGR treatments were compared to a check in a 4-rep RCB designed to evaluate effects upon yield and lodging of Tibor oats. Seeding took place 04 May, and 40 kg N/ha were applied both at seeding and at G.S. 30 (03 June). Spraying was carried out with a CO_2 wand sprayer, and Cycocel, Cerone and Citowett Plus were applied at G.S. 31, 37 and/or 45. No yield effects were seen as a result of any PGR treatment. All three components of yield were likewise unaffected. Several of the Cycocel treatments reduced plant height by as much as 10 cm, but no significant lodging differences were evident.*

ÉTUDE SUR LES RÉGULATEURS DE CROISSANCE DE L'AVOINE TIBOR

Résumé *: Le rendement de l'avoine Tibor et sa résistance à la verse après l'application de 10 régulateurs de croissance dans un dispositif expérimental en blocs divisés au hasard qui a été répété quatre fois ont été comparés aux résultats observés sur une parcelle témoin. L'ensemencement a eu lieu le 4 mai et 40 kg d'azote à l'hectare ont été appliqués au moment de l'ensemencement et au stade de croissance 30 (le 3 juin). Les pulvérisations ont été effectuées au moyen d'un pulvérisateur au CO_2 et du Cycocel, du Cérone et du Citowett Plus ont été appliqués aux stades de croissance 31, 37 et 45. Les régulateurs de croissance n'ont eu aucun effet perceptible sur le rendement. En effet, on n'a décélé aucune répercussion sur les trois indicateurs de rendement. Plusieurs des traitements au Cycocel ont réduit la hauteur des plants d'autant que de 10 centimètres, mais aucune différence significative dans la résistance à la verse n'est apparue.*

INTRODUCTION: Tibor oats is generating considerable interest in N.B. Unlike conventional oats, it threshes free of its hull, and thus is not subject to the discoloration problems associated with late harvesting. It produces a much more nutritious grain than regular oats, making it an appealing ingredient for cattle, swine and poultry feeds. Tibor yields only 70-75% of hulled cultivars, but its potentially improved marketability makes it an attractive option nevertheless. Conversion of N.B.'s current 32,000 acres of oats to Tibor production would bring the province closer to the goal of livestock feed self sufficiency. Like all oats, Tibor is somewhat susceptible to lodging, and the use of PGRs to prevent yield losses and facilitate rapid harvest has been discussed. This study was initiated to evaluate the effectiveness of Cerone and Cycocel with Citowett Plus in the prevention of lodging.

MATERIALS AND METHODS: Tibor oats was seeded 04 May into a prepared seedbed at a rate of 300 viable seeds/m^2. Blanket applications of 40 kg N/ha as urea were applied at both seeding and G.S. 30. Three by 8.5 m plots were staked out according to the 10 treatment, 4 replicate randomized complete block design. Treatment sprays were applied as indicated in Table 1 with a 2 m CO_2 wand sprayer. A spray volume of 500 l/ha and a sprayer pressure of 20 psi were used. A blanket application of Blagal (840 gai/ha or 2.25 l product/ha) was applied at G.S. 21 for weed control. The plots were harvested 19 August with a small plot combine.

RESULTS & DISCUSSION: None of the PGR treatments were effective in reducing lodging susceptibility. The favorable conditions of the 1987 growing season resulted in a generally low level of lodging, and differences between treatments were not significant. Mean treatment yields ranged from 2.9 to 3.2 T/ha, and no significant differences were found between yields nor any of the components of yield. Plant height was the only parameter affected by the PGR treatments. Data collected 12 August (G.S. 80) indicates that some degree of height reduction occurred as a result of all Cycocel treatments. Mean heights of the plots receiving the medium and high rates of Cycocel at G.S. 37 were significantly less than those of the check plots. Conversely, the average height of Cerone-treated plots was significantly greater than that of any other treatment. This unexpected trend appears to be due to site rather than any negative effects of Cerone. Soil at the end of the trial in which all four check plots were located was shallow, and stands were noticeably less vigorous as a result. Difference in soil conditions were not apparent at planting but became noticeable as the growing season progressed.

TABLE 1 - Height, Yield and Lodging of Tibor Oats PGR Treatments
Hartland, 1987.

Treatment[1]					Lodging Ratings[3]	
Product	Rate[2]	Appl.Stage	Height cm	Yield T/ha	05 August	Harvest
Cerone	240	38-45	115.0	3.0	1.1	3.0
Check	---	----	101.3	2.9	.2	1.1
Cycocel	920	39-45	98.8	3.0	.2	1.5
Cycocel	460	39-45	98.6	3.1	.2	1.1
Cycocel	460	22-31	97.4	2.9	.2	.7
Cycocel	920	22-31	97.1	3.1	1.0	2.9
Cycocel	1380	22-31	96.4	3.0	.2	1.2
Cycocel	460	32-37	96.0	3.1	.2	2.3
Cycocel	1380	39-45	95.3	3.1	.2	1.3
Cycocel	920	32-37	90.9	3.1	.2	.9
Cycocel	1380	32-37	87.8	3.1	.2	1.1
LSD.05			10.1	N.S.	N.S.	N.S.

[1] - All Cycocel treatments included Citowett Plus at .05% V/V

[2] - Grams active ingredient /ha

[3] - Belgian Lodging Scale: .2 = erect; 9.0 = totally lodged

CONCLUSIONS: None of the PGR treatments affected yield, yield components or lodging of Tibor oats. Heights were reduced by some Cycocel/Citowett Plus combinations, while Cerone seemed to be ineffective in reducing height. Check plot heights were probably not representative because of a discrepancy in soil conditions of the trial site.

ACKNOWLEDGEMENTS: The authors acknowledge Gerald Springer for providing the land used for this study.

TIBOR OATS SEEDING DATE/RATE STUDY

D.F. Walker and C.J. Duivenvoorden

Abstract: Tibor oats was seeded at six rates on each of three dates to determine effects upon yield and yield components. Seeding rates ranged from 100 to 600 viable seeds/m^2, and seeding took place 04, 14 and 27 May. The 4 rep RCB was split over seeding date. Forty kg N/ha were applied at seeding and again 03 June. Blagal was used for weed control at G.S. 21.

Yields declined by 1.0 T/ha as seeding date was delayed from 04 May to 27 May. Slight yield improvements occurred as seeding rate was increased. Both high seeding rates and late seeding dates led to increases in lodging and decreases in kernel size.

ÉTUDE SUR LES DATES ET LES TAUX D'ENSEMENCEMENT DE L'AVOINE TIBOR

Résumé : De l'avoine Tibor a été semée à raison de six taux d'ensemencement à trois dates différentes afin de déterminer leur effet sur le rendement et les éléments de rendement. Les taux d'ensemencement allaient de 100 à 600 grains viables au mètre carré, et les dates étaient les 4, 14 et 27 mai. L'ensemencement a eu lieu dans un dispositif expérimental en blocs divisés au hasard qui a été répété quatre fois en fonction des dates d'ensemencement. Quarante kg d'azote à l'hectare ont été appliqués à la date d'ensemencement et à nouveau le 3 juin. On a utilisé du Blagal au stade de croissance 21 pour lutter contre les mauvaises herbes.

Entre les parcelles ensemencées le 4 mai et celles ensemencées le 27 mai, les rendements ont diminué d'une tonne à l'hectare. L'augmentation du taux d'ensemencement a permis d'obtenir de légères améliorations du rendement. Les taux d'ensemencement élevés combinés à un ensemencement tardif ont diminué la résistance à la verse et la dimension des grains.

INTRODUCTION: Tibor hull-less oats is an attractive option to conventional oats. It is moderately disease resistant, and does not have the discoloration problems associated with late harvested hulled oats. Tibor yields less than conventional oats but produces a more valuable feed. Naked kernels contain a higher concentration of quality protein and are a good source of energy. While hulled oats have largely been withdrawn from the rations of swine and poultry, hull-less oats are very acceptable ingredients. The opening up of such large new markets would mean that growers would no longer be subjected to the limitations of the current specialized horse feed market. This study was conducted to evaluate the performance of Tibor oats sown on three dates at six seeding rates.

MATERIALS AND METHODS: Tibor oats was seeded on each of three dates, 04, 14 and 27 May, at 6 rates, from 100 to 600 viable kernels/m^2. The experimental design was a randomized complete block with a split over seeding date. Plots were 2 by 8.5 m, and all received 50 kg N/ha at seeding plus an additional application of 40 kg N/ha 03 June. Blagal was applied for weed control at G.S. 21 at a rate of 840 gai/ha or 2.25 l product/ha. Harvest took place 21 and 26 August and 08 September, and was done with a small plot combine.

RESULTS AND DISCUSSION: Large losses were incurred when seeding date was delayed from 04 May to 27 May (Figure 1). Plots seeded on the early date yielded 3.2 T/ha while late seeded plots averaged 2.2 T/ha. Within seeding dates, the greatest yield difference was between the 100 and 200 rates. The fact that plots seeded at the highest rate did not significantly outyield plots seeded at a rate of 300 seeds/m^2 is indicative of the compensatory ability of the crop, and suggests that currently recommended seeding rates of 300-400 kernels/m^2 are sufficient, even when late seeding occurs. The absence of an interactive effect between seeding date and rate suggests that the mechanisms of yield compensation activated by seeding rate differences appear to function independently of seeding date, and that seeding rate increases in late seedings are ineffective in recouping lost yields. The yield significances shown between seeding rates are parallelled by differences in head populations (Figure 2). In spite of higher tillering ratios, plots seeded at the 100 and 200 rates were not able to produce as many heads as other plots, and subsequently yielded less. Data for kernel number per head was not collected. Lodging was more severe both in late seedings and at high seeding rates (Figure 3). Stem etiolation due to early interplant competition and/or accelerated plant growth probably was responsible for this trend.

CONCLUSIONS: Yields of Tibor hull-less oats declined as seeding date was delayed. Within dates, yields were decreased only by the two lowest seeding rates. Higher seeding rates led to higher head populations and lower kernel weights.

ACKNOWLEDGEMENTS: The authors extend thanks to Gerald Springer for providing the plot land used for this study.

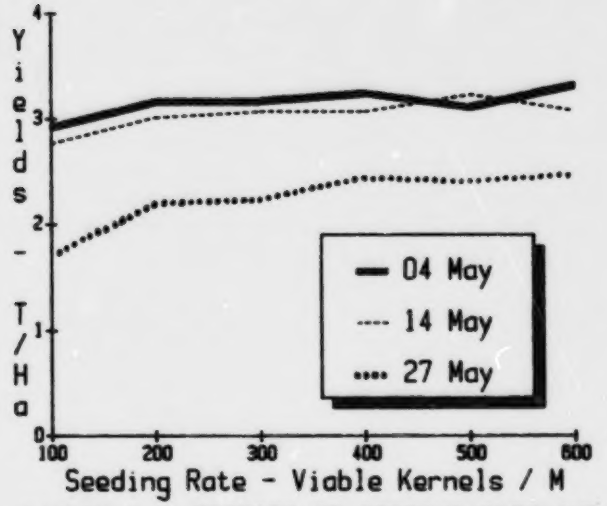


FIGURE 1 - EFFECTS OF SEEDING DATE AND SEEDING RATE ON YIELDS OF TIBOR HULL-LESS OATS (1987)

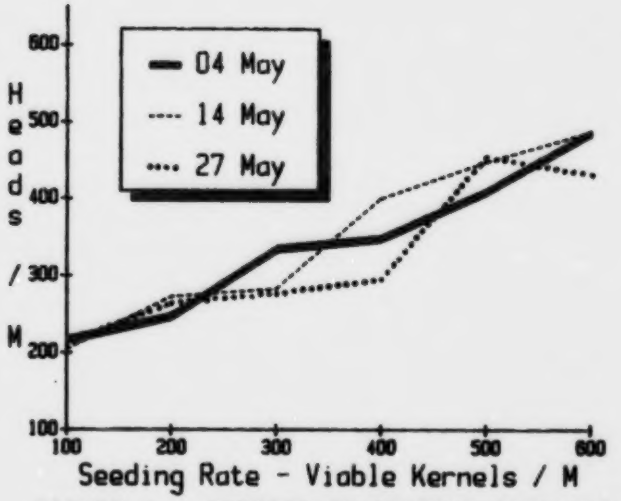
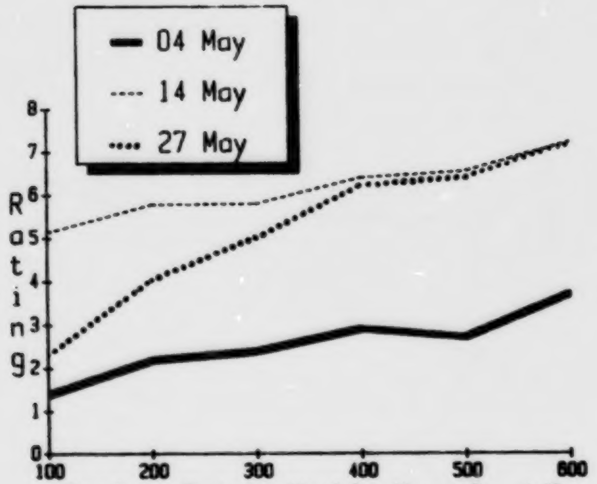
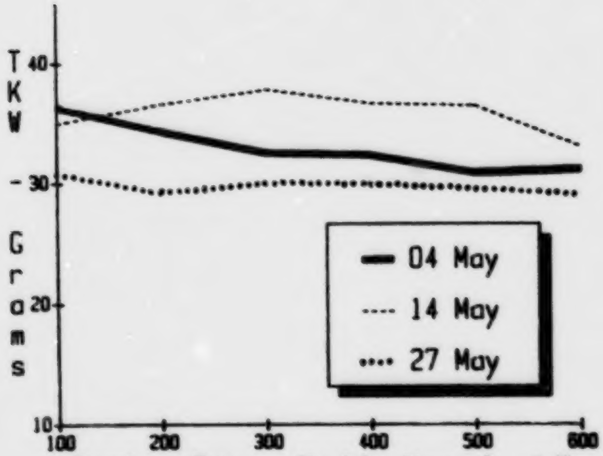


FIGURE 2 - EFFECTS OF SEEDING DATE AND SEEDING RATE ON HEAD COUNTS TIBOR HULL-LESS OATS (1987)



Seeding Rate - Viable Kernels / M

FIGURE 3 - EFFECTS OF SEEDING DATE AND SEEDING RATE ON LODGING OF TIBOR HULL-LESS OATS (1987)



Seeding Rate - Viable Kernels / M

FIGURE 4 - EFFECTS OF SEEDING DATE AND SEEDING RATE ON THOUSAND KERNEL WEIGHT OF TIBOR HULL-LESS OATS (1987)

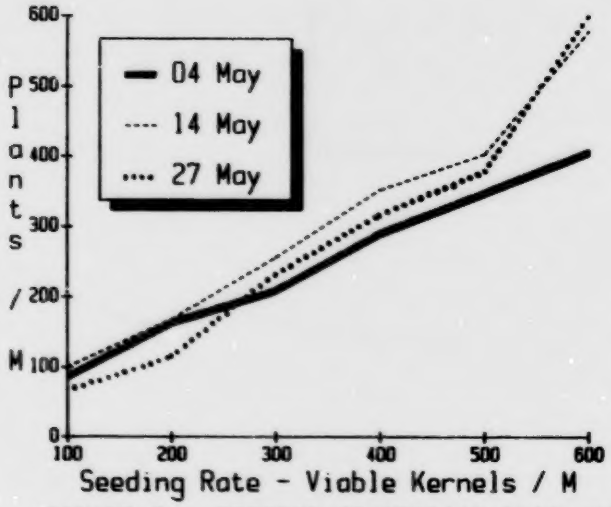


FIGURE 5 - EFFECTS OF SEEDING DATE AND SEEDING RATE ON STAND COUNTS OF TIBOR HULL-LESS OATS (1987)

BARLEY CULTIVAR EVALUATION TRIAL

C.J. Duivenvoorden, D.F. Walker and B.A. Bamford

Abstract: *Twelve barley cultivars were evaluated in a 4 rep RCB study seeded 28 April at Hartland. Two applications of 40 kg N/ha were made, one at seeding and the second on 29 May at G.S. 23.*

Highest yields, 5.1 and 5.0 T/ha, were produced by cultivars QB198-27 and QB221-34 respectively. Cadette, OB621-4, and Leger all yielded 4.9 T/ha. Leger had the highest resistance to lodging, followed by QB195-27, QB221-34 and Cadette. TKW ranged from 45.2 g for QB751-12 to 34.8 g for Joly.

ESSAI D'ÉVALUATION DES CULTIVARS D'ORGE

Résumé : *Douze cultivars d'orge ont fait l'objet d'une évaluation à Hartland, dans un dispositif expérimental en blocs divisés au hasard qui a été répété quatre fois. L'ensemencement a eu lieu le 28 avril à Hartland. On a appliqué de l'azote à raison de 40 kg à l'hectare à deux reprises; une fois au moment de l'ensemencement et une autre fois le 29 mai au stade de croissance 23.*

Les rendements les plus élevés, 5,1 et 5,0 tonnes à l'hectare ont été obtenus pour les variétés QB198-27 et QB221-34 respectivement. Les variétés Cadette, OB621-4 et Leger ont toutes donné des rendements de 4,9 tonnes à l'hectare. La variété Leger est celle qui a le mieux résisté à la verse, suivie par les variétés QB195-27, QB221-34 et la variété Cadette. Le poids par mille de grains allait de 45,2 g pour la variété QB751-12 à 34,8 g pour la variété Joly.

INTRODUCTION: Barley remains an important crop in N.B. It is the most short seasoned cereal, and fits very well into rotations with crops such as potatoes. It can be seeded as soon as fields can be worked, and is usually ready for harvest by mid-August, before potato crops are mature. The introduction of new cultivars and new management techniques in recent years has allowed producers to regularly realize yields in excess of 5.5 T/ha. Leger, the current favorite, has high yield potential and good disease resistance. Breeding programs continue to develop new cultivars with greater yielding ability and improved straw strength.

This study was conducted to evaluate and compare the performance of 12 feed barley cultivars.

MATERIALS AND METHODS: A Wintersteiger plot drill with a 12 cm spacing was used to seed 12 barley cultivars in 2 x 8.5 m plots arranged in a 4 replicate RCB design. At seeding, 40 kg N/ha were applied, and were supplemented by a further identical application on 29 May at G.S. 23. The plots were harvested 05 August with a small plot combine.

Table 1: Yield and Agronomic Characteristics of Barley Cultivars - Hartland, 1987.

Cultivar	Yield T/ha	Lodging 13 July	Rating* Harvest	Heads/ m^2	TKW grams
QB198-27	5.1	1.7	1.6	411	41.4
QB221-34	5.0	.2	.9	461	40.7
Cadette	4.9	.2	1.2	428	40.3
QB621-4	4.9	3.0	2.9	371	39.8
Leger	4.9	.2	.6	344	38.6
Rodeo	4.8	.6	1.3	560	45.0
AB73.3	4.8	.6	1.6	572	45.0
Joly	4.8	.8	4.8	386	34.8
OB751.12	4.7	1.1	2.0	612	45.2
QB195-27	4.7	.4	.9	365	38.2
QB532-13	4.5	4.2	4.0	344	40.8
Micmac	4.3	2.2	3.4	582	39.1
LSD.05	.3	1.2	1.0	86	2.4

*Belgian Lodging Scale: .2 = erect; 9.0 = totally lodged

RESULTS AND DISCUSSION: The soil pH of the plot area was 5.2, much lower than previously considered acceptable for barley production. The average yield of 4.8 T/ha was high, indicating that the latest barley cultivars have some tolerance to low pH soils.

QB198-27 was the highest yielding barley for the second year, producing 5.3 T/ha (Table 1). QB221-34, Cadette and OB621-4 (OAC Kippen) produced yields of 4.9 T/ha. Micmac was the lowest yielding cultivar at 4.3 T/ha. Kernel weights were high for nearly all cultivars, as disease pressure was light during 1987. OB751-12, AB73-3 and Rodeo, three 2-row cultivars, all had thousand kernel weights greater than 45 g. Leger and Cadette produced the most kernels/head, 59.4 and 51.9 respectively. The 2-row cultivars all produced fewer than 25.5 k/head, but compensated by producing nearly 200 heads/m^2 more than the average of 6 row barleys. Lodging was not a major problem in 1987, again due to a favorable growing season. Leger lodged the least of all cultivars, followed by QB221-34 and QB195-27. Cadette, the only semi dwarf barley in the trial, also stood very well.

CONCLUSIONS: Leger and Cadette, currently recommended cultivars, were once again leading performers. Both produced high yields and lodged only slightly. QB198-27 was the top yielding cultivar for the second year and should be added to the recommended list by 1990. QB221-34, a first time inclusion in the trial, shows promise both in yield potential and lodging resistance.

ACKNOWLEDGEMENTS: Thanks are extended by the authors to Gerald Springer for providing land for this study.

MALTING BARLEY CULTIVAR EVALUATION TRIAL

D.F. Walker, C.J. Duivenvoorden and B.A. Bamford

Abstract: *The yield and malting characteristics of 11 malting barley cultivars were compared in a 4 replicate RCB study. Plots were seeded 28 April at Hartland, and received 40 kg N/ha at planting. A small plot combine was used to harvest the crop 7 August.*

TR219 and TR930 produced yields of 5.1 T/ha, followed by Rodeo and Harrington with 4.9 T/ha. Disease levels were generally low, and TKW ranged from a high of 43.8 g for Rodeo to a low of 32.6 g for Bonanza. All cultivars attained malting grade, and only Bonanza and BT 916 failed to make the Special Select grade.

ESSAI D'ÉVALUATION DE CULTIVARS D'ORGE DE MALTAGE

Résumé : *Le rendement et les caractéristiques de maltage de 11 cultivars d'orge de maltage ont été comparés dans un dispositif expérimental en blocs divisés au hasard qui a été répété quatre fois. Les parcelles ont été ensemencées le 28 avril à Hartland et ont reçu 40 kg d'azote à l'hectare lors de l'ensemencement. Une petite moissonneuse-batteuse a été utilisée afin de procéder à la récolte le 7 août.*

Les variétés TR219 et TR930 ont donné des rendements de 5,1 tonnes à l'hectare, suivies par les variétés Rodéo et Harrington à 4,9 tonnes à l'hectare. La prévalence des maladies était généralement faible et le poids par mille grains allait d'un maximum de 43,8 g pour la variété Rodéo à un minimum de 32,6 g pour la variété Bonanza. Tous les cultivars ont atteint un stade de croissance suffisant pour le maltage et seules les variétés Bonanza et BT 916 n'ont pu être classées "Special Select".

INTRODUCTION: The international cereal market continues to be characterized by low prices due to high yields and strong competition for markets. Maritime farmers have not been exempted from the trend, and local grain prices have fallen to unprecedented lows in the past 12 months. In spite of returns below production costs, provincial acreage has not declined significantly. Potato farmers in particular continue to favor oats, barley and wheat because of relative ease of production and rotational benefits. Malting barley is a high value specialty crop and has potential in N.B. It is not currently grown here, but has the same rotational advantages as conventional cereals. Successful production requires more attention to crop management and harvest, but the premium price paid for grain attaining malting grade more than offsets the costs of additional inputs. Challenges to be overcome before commercial production of malting barley can be initiated include the identification of both economically superior cultivars and management protocols.

This study was undertaken to evaluate the commercial malting potential of one local and 10 Western cultivars under N.B. conditions.

MATERIALS AND METHODS: Eleven malting barley cultivars were seeded 28 April at Hartland in a 4 replicate randomized complete block design. A Wintersteiger plot drill with a 12 cm row spacing was used to seed the 2 x 8.5 m plots with 300 viable kernels/m^2. Only 40 kg N/ha were applied at seeding. A small plot combine was used to harvest the plots on 5 August.

RESULTS AND DISCUSSION: Both yield and kernel quality were very high for all malting barleys as a result of the excellent growing conditions of the 1987 season. Grading results indicate that 2 cultivars were designated Select C.E. and the other 9 attained the highest possible grade, Special Select C.E. Lack of infrastructure and stringent grading requirements pertaining to kernel color and uniformity have prevented previous production in N.B. However, the appeal of malting barley may be enhanced by the fact that grade requirements do favor low protein grain, and N fertilization may thus be reduced. Farmer acceptability of the crop will additionally be improved if the risks of downgrading to feed are minimal. In spite of low inputs, average yields of this study were 4.8 T/ha, identical to those of the 1987 feed barley trial (Table 1). The optimism generated by this work, however, should be tempered by the fact that 1987 conditions for both growth and harvest of barley were more favorable than average. Disease pressure was not sufficient to fairly evaluate the resistance of non-adapted Western cultivars. Both TR 219 and TR 930 produced yields of 5.1 T/ha (Table 1). Harrington, a cultivar currently popular with both Western Canadian farmers and maltsters, yielded 4.9 T/ha. Ellice does have the potentially desirable trait of malting more quickly than most other barleys, but relatively low yields will probably prevent its widespread acceptance.

Table 1: Yield and Agronomic Data of Malting Barley Cultivars - Hartland 1987.

	Yield	TKW	Lodging Index*		Heads	Kernels/
Cultivar	T/Ha	grams	13 July	Harvest	/m^2	Head
TR219	5.1	43.8	.2	2.5	537	30.2
TR930	5.1	41.3	.2	.5	701	23.1
Rodeo	4.9	44.8	.6	1.4	547	28.2
Harrington	4.9	40.7	.2	2.7	601	22.7
TR490	4.8	41.6	.2	.2	603	25.9
Argyle	4.8	32.8	.2	3.5	314	59.0
TR700	4.7	41.6	.4	2.3	586	22.5
BT916	4.7	34.4	.2	4.7	306	54.8
ET917	4.7	33.6	.4	4.4	388	55.2
Ellice	4.5	39.2	.4	3.5	572	25.7
Bonanza	4.3	32.6	1.1	4.2	309	55.8
LSD.05	.3	1.8	.4	1.7	87	8.1

*Belgian Lodging Scale: .2 = erect; 9.0 = totally lodged

Several distinctions were evident between 2-row and 6-row cultivars. Lodging was more severe in heavy headed 6-row barleys, but was not serious enough to reduce kernel quality or impede harvest. Two row barleys produced fewer kernels per head, but compensated by producing more heads/m^2. Kernel weight was also greatest in 2-row cultivars since all kernels developed from central florets of spikelets.

CONCLUSIONS: Excellent growing and harvest conditions led to the production of malting quality barley by all cultivars evaluated in 1987. Top yields were produced by TR 219 and TR 930. Two row cultivars produced larger kernels, more heads and fewer kernels/head than 6-row barleys. Lodging was not a serious problem, but was most prevalent in plots of 6-row cultivars. Evaluation of the most promising cultivars will continue in order to assess long term suitability of malting barley as a viable cropping alternative.

ACKNOWLEDGEMENTS: The authors express thanks to Gerald Springer for the provision of plot land.

LEGER BARLEY SEEDING DATE/RATE STUDY

D.F. Walker and C.J. Duivenvoorden

Abstract: *This study was conducted to evaluate the effects of seeding date and seeding rate upon yield and yield components of Leger barley. The plots were seeded on each of 3 dates, 04, 14 and 27 May, in a 4 replicate RCB experiment. The design was split over seeding date, and six seeding rates were used on each date, from 100 to 600 viable seeds/m^2. Forty kg N/ha as urea were applied at seeding and again on 03 June, and Blagal (840 gai/ha or 2.25 l product/ha) was used for weed control at G.S. 21.*

Yields were highest in earliest seeded plots, and declined sharply as seeding date was delayed. Seeding rate increases up to 500 kernels/m^2 produced slight increases in yield. Kernel size and kernel number per head declined as seeding rate was increased, and lodging became more severe as seeding date was delayed and as seeding rate was increased.

ÉTUDE SUR LES DATES ET LES TAUX D'ENSEMENCEMENT DE L'ORGE LÉGER

Résumé : *Cette étude a été effectuée afin d'évaluer les effets des dates et des taux d'ensemencement sur le rendement et les différents éléments de rendement de l'orge Léger. Les parcelles ont été ensemencées à chacune des trois dates suivantes : les 4, 14 et 27 mai, dans un dispositif expérimental en blocs divisés au hasard qui a été répété quatre fois. Le dispositif était divisé en fonction des dates d'ensemencement et on a utilisé six taux d'ensemencement à chaque date, soit de 100 à 600 grains viables au mètre carré. Quarante kg d'azote à l'hectare sous forme d'urée ont été appliqués à l'ensemencement et l'application a été répétée le 3 juin. Du Blagal (840 g ai/ha ou 2,25 l produit/ha) a été appliqué pour lutter contre les mauvaises herbes au stade de croissance 21.*

Les rendements ont été plus élevés dans les parcelles ensemencées plus précocement et déclinaient rapidement plus la date d'ensemencement était tardive. Les augmentations du taux d'ensemencement jusqu'à 500 grains au mètre carré n'ont produit que de légères augmentations du rendement. Plus le taux d'ensemencement était élevé plus la dimension des grains et le nombre de grains par épi baissaient; la résistance à la verse était moins grande à mesure que la date d'ensemencement était retardée et que le taux d'ensemencement était augmenté.

INTRODUCTION: Barley is gaining popularity in N.B. as producers recognize the potential of new high performance cultivars. When first released several years ago, Leger outperformed all contemporary barleys. The naturally high yielding ability of the cultivar combined with a higher level of management has frequently resulted in yields in excess of 5.5 T/ha. Leger is somewhat tolerant of low pH soils, and remains popular, especially with potato farmers. Seeding date and seeding rate are two frequently underrated management factors with major yield implications. This study is a continuation of work initiated in 1986 for the purpose of determining and quantifying the effects of seeding date and seeding rate upon yield and yield components of Leger barley.

MATERIALS AND METHODS: Leger barley was seeded at 6 rates on each of 3 dates in a 4 replicate complete block design. The six seeding rates were 100 to 600 viable seeds/m^2, in increments of 100, and seeding was done on 04, 14 and 27 May. The experiment was split over seeding date and plots were 2 x 8.5 m in size. Urea was applied to all plots at seeding and again on 03 June, providing 40 kg N/ha each time. A treatment of Blagal (840 gai/ha or 2.25 l product/ha) applied at G.S. 21 provided weed control. Plots were harvested on 10, 20 and 26 August with a small plot combine.

RESULTS AND DISCUSSION: Yield losses of 1.6 T/ha were incurred as seeding date was delayed from 04 May to 27 May (Fig. 1). Analysis of yield components suggests that reductions in kernel size and kernel number were jointly responsible for the trend (Fig. 2-5). Examination of seeding and harvest dates shows that plots planted 27 May had a life cycle 7 days shorter than those seeded 04 May. This compression was probably due to simultaneous photoperiodic and temperature stimuli which caused the late seeded crop to progress rapidly through vegetative stages. The resulting smaller plants were likely not fully equipped to produce and fill heads, and had less time to do so (Walker and Duivenvoorden, 1986). Small yield improvements were also noted as seeding rates increased to 500 kernels/m^2. Slight kernel weight reductions which occurred presumably as a result of thicker canopies were more than offset by increases in total kernel number produced. Kernel number increases, in turn, were accounted for mostly by greater head population, as an 83% correlation was found between the two parameters.

Results suggest that lodging severity was cumulatively affected by both seeding date and seeding rate (Fig. 6). Stem etiolation in late seeded plots, because of accelerated vegetative growth, and stem weakness in densely seeded plots, due to earlier interplant competition, both appear to have increased crop susceptibility to lodging.

CONCLUSIONS: Due to reductions mainly in kernel number, irrecoverable yield losses resulted when seeding date was delayed. Seeding rate effects were not nearly as pronounced, and only slight yield increases were noted as seeding rate increased to 500 kernels/m^2. Thousand kernel weights and kernel numbers per head declined at high seeding rates, and culm density increased with seeding rate. Delayed seeding date and increased seeding rates cumulatively had the effect of enhancing crop susceptibility to lodging.

REFERENCES: Walker, D.F. and Duivenvoorden, C.J. 1986. Leger Barley Seeding Date/Rate Study. Adaptive Research Reports, N.B. Department of Agriculture. 8:87-101.

ACKNOWLDGEMENTS: Thanks are extended to Gerald Springer for the use of plot land.

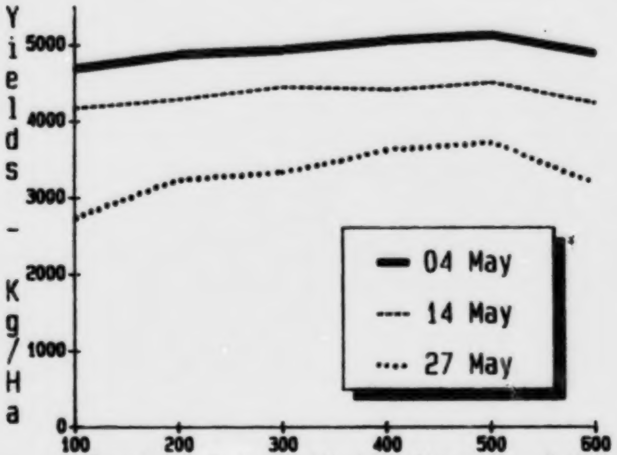


FIGURE 1 - EFFECTS OF SEEDING DATE AND SEEDING RATE ON YIELDS OF LEGER BARLEY (1987)

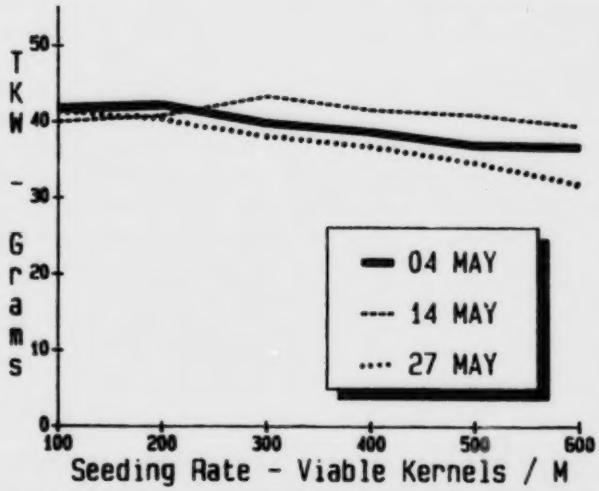
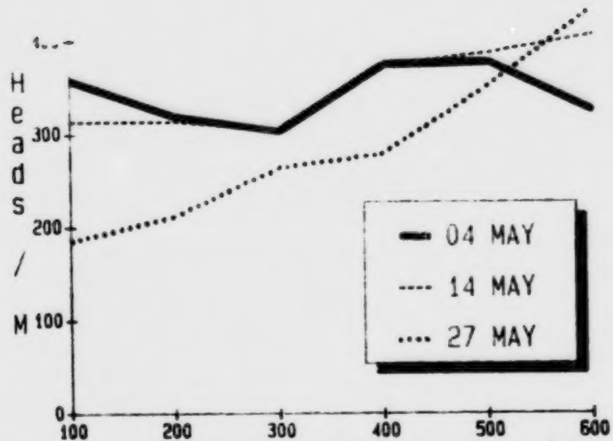
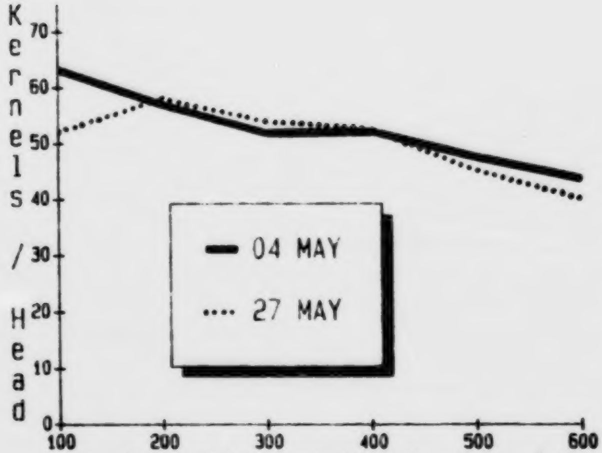


FIGURE 2 - EFFECTS OF SEEDING DATE AND SEEDING RATE ON TKW OF LEGER BARLEY (1987)



Seeding Rate - Viable Kernels / M

FIGURE 3 - EFFECTS OF SEEDING DATE AND SEEDING RATE ON HEAD COUNTS OF LEGER BARLEY (1987)



Seeding Rate - Viable Kernels / M

FIGURE 4 - EFFECTS OF SEEDING DATE AND SEEDING RATE ON KERNELS PER HEAD OF LEGER BARLEY (1987)

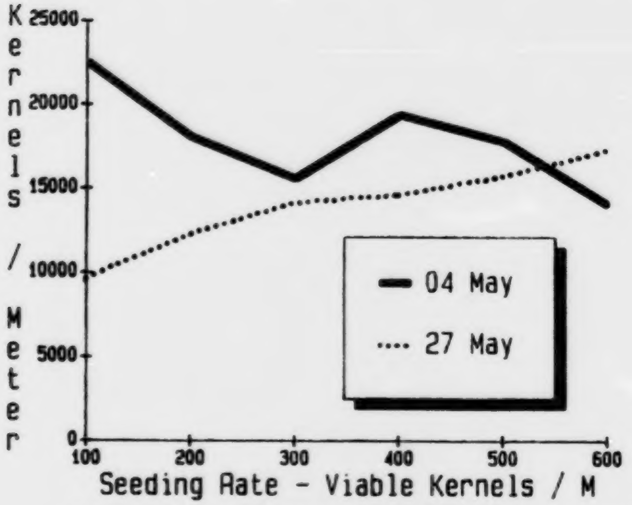


FIGURE 5 - EFFECTS OF SEEDING DATE AND SEEDING RATE ON KERNELS PER METER OF LEGER BARLEY (1987)

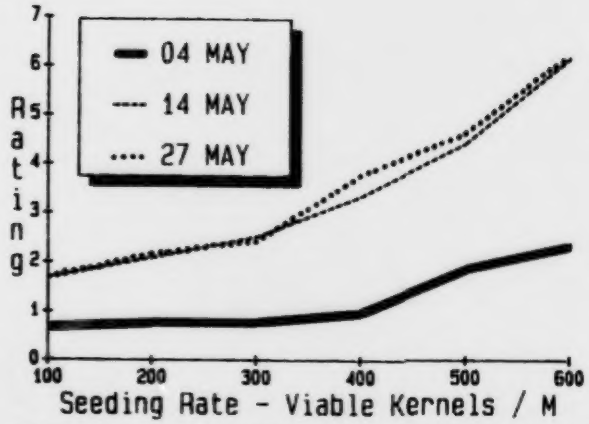


FIGURE 6 - EFFECTS OF SEEDING DATE AND SEEDING RATE ON LODGING OF LEGER BARLEY (1987)

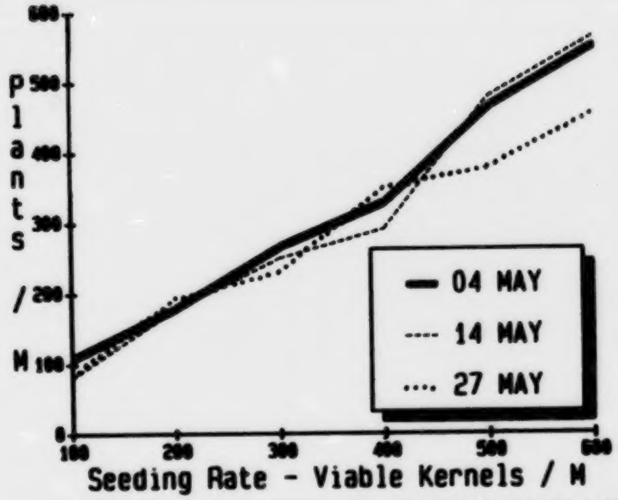


FIGURE 7 - EFFECTS OF SEEDING DATE AND SEEDING RATE ON PLANT POPULATIONS OF LEGER BARLEY (1987)

CADETTE BARLEY GROWTH ANALYSIS

D.F. Walker and C.J. Duivenvoorden

Abstract: *This study was conducted to determine the nutrient profile of Cadette barley and to monitor parameters of crop physiology throughout the growing season. Four .5 m*^{2} *plots were harvested weekly from 27 May to 19 August, and all above ground biomass was collected. Parameters such as plant population, tillering ratio, plant height and dry matter accumulation were measured, and a tissue sample was analyzed to determine the N, P, K and Ca profiles of the crop.*

Based upon the weekly harvest, the stand averaged 230 plants/m^2*. An early peak of 780 culms/m*^{2} *or 3.4 culms/plant was attained 10 June, but only 350 of these eventually produced heads. Over 10 T/ha of dry matter containing 140 kg N/ha and 23 kg P/ha had been accumulated by 19 August. Potassium and Calcium contents peaked early in the season at 207 and 42 kg/ha respectively, and declined with the onset of maturity. A plant height of about 90 cm was attained by G.S. 70. Internode growth was successive and each of the 6 internodes was longer than the one before.*

ANALYSE DE LA CROISSANCE DE L'ORGE CADETTE

Résumé *: Cette étude a été effectuée afin d'établir le profil des éléments nutritifs de la variété d'orge Cadette et de surveiller les paramètres de la physiologie de la récolte tout au long de la saison de croissance. On a donc procédé à la récolte hebdomadaire de quatre parcelles de 0,5 mètre carré du 27 mai au 19 août. Toute la biomasse au-dessus du niveau du sol était recueillie. Les paramètres comme la densité des plants, le rapport de tallage, la hauteur des plants et l'accumulation de matières sèches ont été mesurés et un échantillon de tissu a été analysé afin d'établir le profil de N, P, K et Ca de la récolte.*

Si l'on se fonde sur les récoltes hebdomadaires, on comptait en moyenne 230 plants au m^2. Un sommet hâtif de 780 tiges potentielles au m^2 ou 3,4 tiges potentielles par plant a été atteint le 10 juin, mais seules 350 de ces tiges potentielles ont donné des épis. Au 19 août, plus de 10 tonnes à l'hectare de matières sèches contenant 140 kg d'azote à l'hectare et 23 kg de phosphore à l'hectare avaient été accumulées. La teneur en potassium et en calcium a atteint un sommet tôt au début de la saison, 207 kg et 42 kg à l'hectare respectivement, pour ensuite descendre progressivement à mesure que les plants parvenaient à maturité. Au stade de croissance 70, la hauteur moyenne des plants était d'environ 90 cm. La croissance internodale a été progressive et chacun des six entrenoeuds était plus long que celui qui le précédait.

INTRODUCTION: Cadette barley is one of the newest cultivars to be added to the recommended list. A Laval release, Cadette is a strong-strawed semi-dwarf barley with a yield potential slightly exceeding that of Leger. It is moderately disease resistent, and will probably begin to displace Leger acreage once seed becomes more readily available. Preliminary management work has been completed on Cadette, but supplemental information pertaining to parameters of physiological growth will prove useful in determining optimum production programs. As well, in depth information regarding nutrient requirements and uptake will assist in determining fertility regimes.

This study was undertaken to monitor the plant population, tillering ratio, plant height, dry matter accumulation and internode development of Cadette barley on a week to week basis, and to determine the nutrient uptake profile of the crop from emergence to harvest.

MATERIALS AND METHODS: A block of Cadette barley was seeded 04 May. The seedbed had been conventionally prepared, and had been fertilized with 40 kg N/ha as urea. Another 40 kg N/ha were applied at G.S. 30, and Blagal at 840 gai/ha (2.25 l product/ha) was used for weed control. Fifty-two .5 m^2 plots were staked after emergence based upon uniformity of stand and sufficiency of border. Collection of all above ground dry matter from 4 plots took place weekly from 27 May to 19 August. The material was cleaned, and plant population was determined. Tillering ratio, plant height and internode length were measured from a subsample of at least 10 plants. The collected material was weighed both before and after drying. A tissue sample was submitted for laboratory analysis, and results were used to extrapolate crop contents of N, P, K and Ca on a week to week basis.

RESULTS AND DISCUSSION: Population of the stand averaged 230 plants/m^2 over the course of the growing season. Tillering commenced almost immediately after emergence, and as high as 3.4 culms/plant or 780 culms/m^2 were observed (G.S. 31). A decline in potential culm number occurred with the onset of interplant competition, and an average of 350 heads/m^2 were carried through to maturity. Dry matter accumulation of the crop was most rapid between G.S. 31 and G.S. 75, and subsequent weekly increases were slight. The average dry matter yield of the 5 weeks prior to maturity was about 10.5 T/ha. The crop absorbed approximately 140 kg N/ha from the soil, comparable to levels recorded in a previous study (Walker and Duivenvoorden, 1986.) Monitoring of phosphorus showed that only about 23 kg/ha had been absorbed at maturity. Both K and Ca contents peaked early in the growth cycle (G.S. 55) at 207 and 42 kg/ha respectively. A later loss of senesced leaves combined with some degree of intraplant immobility of K and Ca probably were responsible for this effect. Maximum plant height was only 95 cm, indicative of the semi-dwarf characteristic of the cultivar. Six internodes developed successively in telescopic fashion, and each was longer than its predecessor.

Table 1: Growth Stages of Cadette Barley - 1987

Date	Zadoks Growth Stage
27 May	13/21
03 June	30
10 June	31
17 June	32
24 June	39
01 July	51
08 July	72
15 July	77
22 July	83
29 July	87
05 August	92

CONCLUSIONS: For the second year, the absorption of N by a barley crop exceeded actual fertility applications by more than 40 kg/ha. The importance of soil organic matter as an ongoing reserve of N is reiterated and N fertility recommendations for intensive cropping programs may require adjusting. No phosphorus, potash nor calcium had been applied as fertilizer, but high soil levels built up through years of potato production provided the 23, 207 and 40 kg/ha absorbed respectively. Other data parameters collected not only clarify the stages of crop growth, but will provide useful reference points upon which to base future production recommendations.

REFERENCES: Walker, D.F. and Duivenvoorden, C.J. 1986. Leger Barley Growth Analysis. Adaptive Research Reports, N.B. Department of Agriculture. 8:167-172.

ACKNOWLEDGEMENTS: Thanks are extended to Gerald Springer for providing plot land.

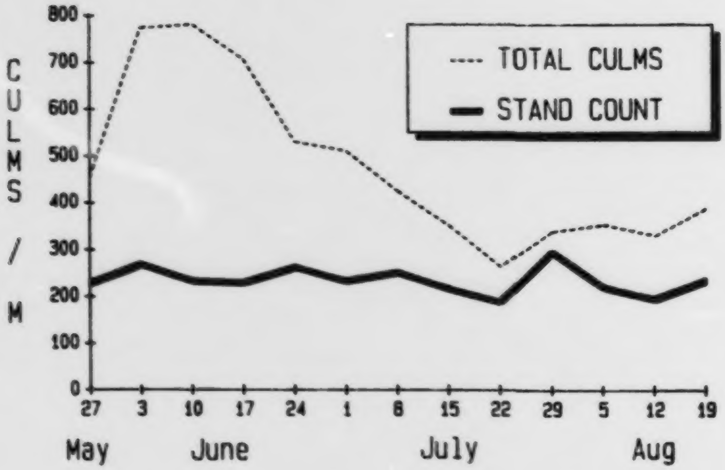


FIGURE 1 - CADETTE BARLEY GROWTH ANALYSIS
PLANTS AND TOTAL CULMS
PER METER SQUARED (1987)

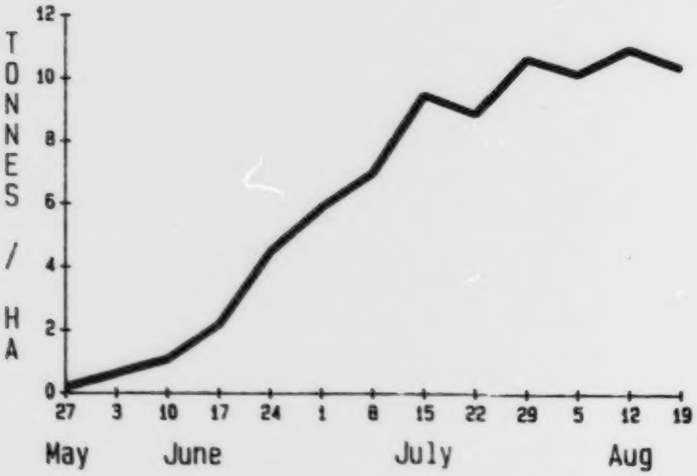


FIGURE 2 - CADETTE BARLEY GROWTH ANALYSIS
DRY MATTER YIELD PER
HECTARE - TONNES (1987)

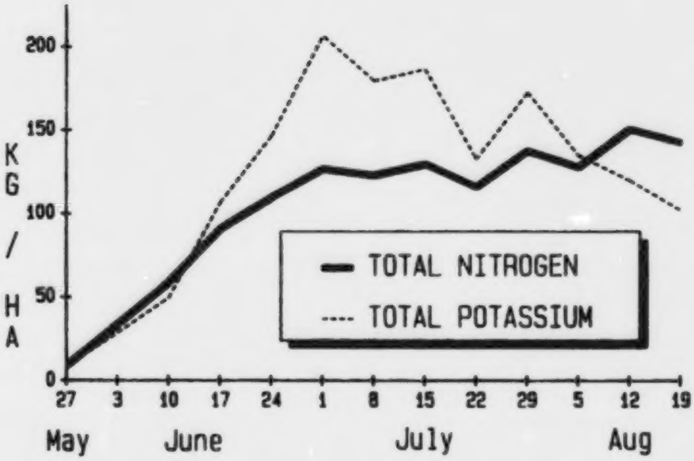


FIGURE 3 - CADETTE BARLEY GROWTH ANALYSIS
NITROGEN AND POTASSIUM
UPTAKE PROFILE - KG/HA (1987)

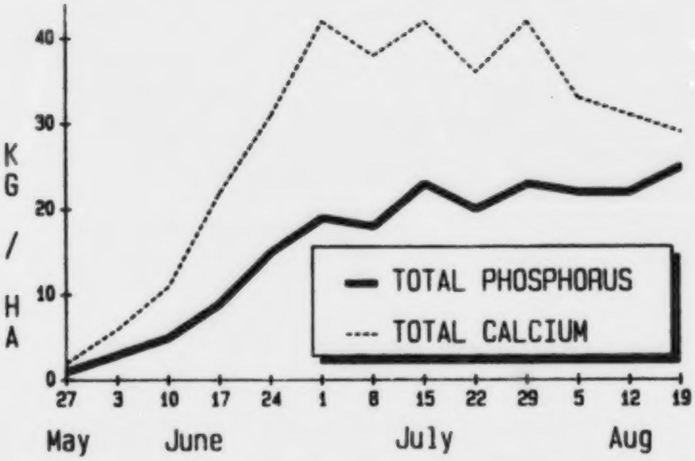


FIGURE 4 - CADETTE BARLEY GROWTH ANALYSIS
PHOSPHORUS AND CALCIUM
UPTAKE PROFILE - KG/HA (1987)

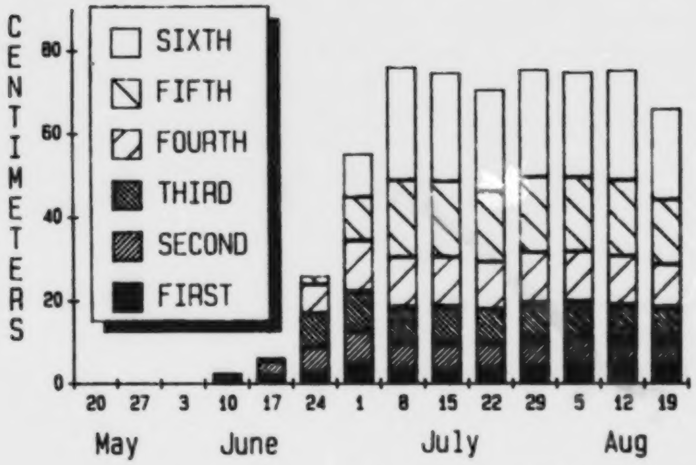


FIGURE 5 - CADETTE BARLEY GROWTH ANALYSIS
INTERNODE LENGTHS -
CENTIMETERS (1987)

CADETTE BARLEY SEEDING DATE/RATE STUDY

D.F. Walker and C.J. Duivenvoordon

Abstract: *In order to determine the effects of seeding dates and rates on yield and yield components, Cadette barley was seeded at 6 rates, 100 to 600 viable kernels/m^2, on each of 3 dates, 04, 14 and 27 May, in a 4 replicate RCB split over seeding date. Fertility was applied in the form of urea at a rate of 40 kg N/ha at seeding and again on 29 May. Weed control was accomplished by an application of 840 gai/ha Blagal at G.S. 21.*

Yield declined as seeding date was delayed. Both thousand kernel weight and kernel number per head decreased as seeding rate increased. Lodging increased at higher seeding rates.

ÉTUDE SUR LES DATES ET LES TAUX D'ENSEMENCEMENT DE L'ORGE CADETTE

Résumé : *Afin de déterminer les effets des dates et des taux d'ensemencement sur le rendement et les éléments de rendement, on a semé de l'orge Cadette à six taux différents, soit de 100 à 600 grains viables au mètre carré, à chacune des trois dates suivantes, soit les 4, 14 et le 27 mai, dans un dispositif de blocs divisés au hasard qui a été répété à quatre fois et en fonction des dates de semis. L'engrais a été appliqué sous la forme d'urée à un taux de 40 kg d'azote à l'hectare au moment de l'ensemencement et on a répété l'application le 29 mai. La répression des mauvaises herbes a été effectuée au moyen de l'application de 840 g ai/ha de Blagal au stade de croissance 21.*

Plus la date de semis était tardive, plus le rendement a eu tendance à décliner. Tant le poids par mille grains que le nombre de grains par épi ont diminué à mesure qu'on augmentait le taux d'ensemencement. La résistance à la verse était moins grande aux taux d'ensemencement les plus élevés.

INTRODUCTION: The production approaches of high yield management have allowed N.B. grain producers to significantly increase yields in recent years. Potato farmers who produce cereals as rotational crops on highly fertilized soils have in particular given rise to this trend. Barley has been one of the most responsive cereals, and recent breeding efforts have focussed on developing high performance cultivars with lodging resistance and low pH tolerance. Cadette is one of the most promising barleys currently available. It responds well to management, is tolerant of acidic soils and has a short, stiff straw. Maximum economic yields of Cadette may be realized once a specific regimen of production can be established.

This experiment was undertaken to determine the effects of seeding date and seeding rate upon the yield and yield components of Cadette barley.

MATERIALS AND METHODS: Cadette barley was seeded into a prepared seedbed on each of three dates, 04, 14 and 27 May. Six seeding rates were used at each date, ranging from 100 to 600 viable kernels/m^2 in increments of 100. The experiment was a 4 replicate randomized complete block design split over seeding date. Urea was applied at a rate of 40 kg N/ha prior to seeding, and a further identical application was made 29 May. Blagal was applied at a rate of 840 gai/ha (2.25 l product/ha) at G.S. 21. A small-plot combine was used to harvest the crop on 10, 20 and 26 August.

RESULTS AND DISCUSSION: The trend of decreased yields with delayed seeding noted in this study coincides with that found in a concurrent Leger barley experiment (Walker and Duivenvoorden, 1987). Yields were affected more by seeding date than by seeding rate (Fig. 1). Large losses were incurred when seeding date was delayed, reinforcing the importance of early spring sowing. Thousand kernel weights were reduced by late seeding (Fig. 2), likely because of both weaker plant grain-filling mechanisms and a shorter grain filling period (Walker and Duivenvoorden, 1986). In addition, the later seeded crops were more susceptible to disease, particularly the higher seeding rates with lush, thick stands. The 1987 results show that yield was unaffected by seeding rate at all three dates. The lack of response to increased seeding rates was due to the ability of the barley plant to compensate across a wide range of seeding rates. The compensation resulted in a high tillering ratio at the low seeding rate (approximately 3 tillers per seed) and a low tillering ratio at the high rate with only .7 tillers/seed (Fig. 3). The resulting head population ranged from approximately 300 at the low seeding rate to 420 at the high rate rather than parallelling the seeding rate of 100 to 600.

Compensation also occurred with TKW and kernel number per head (Fig. 4). Both factors increased as seeding rates declined. It appears that Cadette barley will adjust its yield components to achieve maximum yield across a wide range of seeding rates.

Lodging was most severe in late seeded and densely seeded plots (Fig. 5). In both instances, the effects observed can probably be explained by the onset of interplant competition at an early growth stage, and subsequent etiolation of stems.

CONCLUSIONS: Yield losses were incurred when seeding date was delayed, and could not be recouped by seeding rate adjustments. Seeding rates of 300-400 viable seeds/m^2, which correspond to field rates of 110 kg/ha or 100 lb/ac, yielded well at all three seeding dates.

Fewer heads were produced at low seeding rates, but increased kernel number per head compensated to prevent yield reductions. A trend of declining kernel size was evident as seeding rate increased. Lodging was most severe at the later seeding dates and higher seeding rates.

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Walker, D.F. and Duivenvoorden, C.J. 1986. Leger Barley Seeding Date/Rate Study. Adaptive Research Reports, N.B. Department of Agriculture. 8:97-101.

ACKNOWLEDGEMENTS: The authors extend thanks to Gerald Springer for supplying plot land.

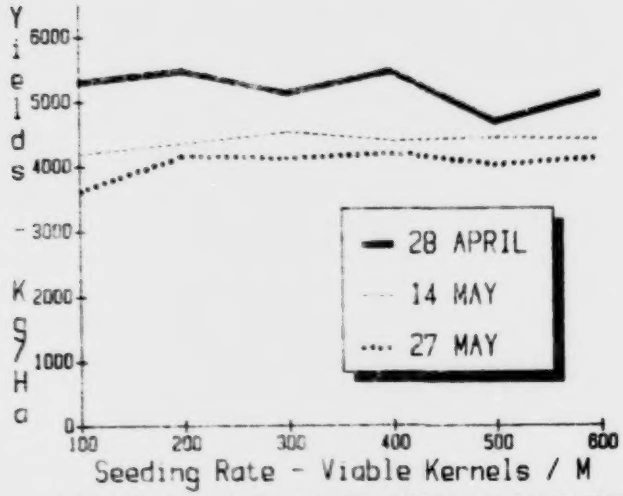

FIGURE 1 - EFFECTS OF SEEDING DATE AND SEEDING RATE ON YIELDS OF CADETTE BARLEY (1987)

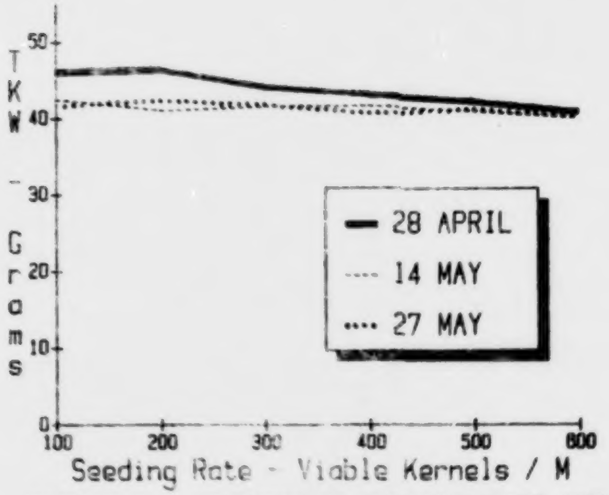

FIGURE 2 - EFFECTS OF SEEDING DATE AND SEEDING RATE ON TKW OF CADETTE BARLEY (1987)

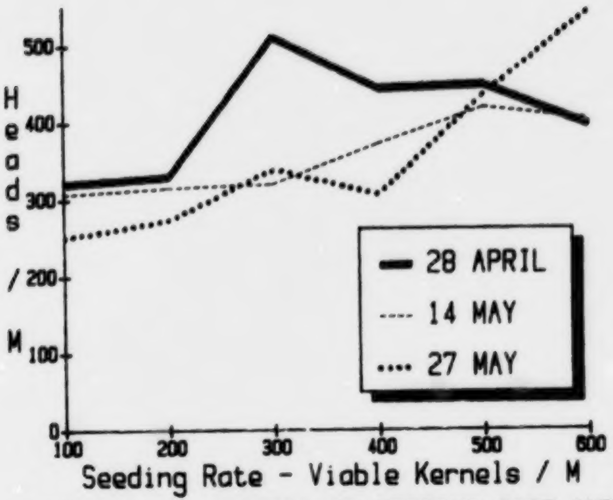

FIGURE 3 - EFFECTS OF SEEDING DATE AND SEEDING RATE ON HEAD COUNTS OF CADETTE BARLEY (1987)

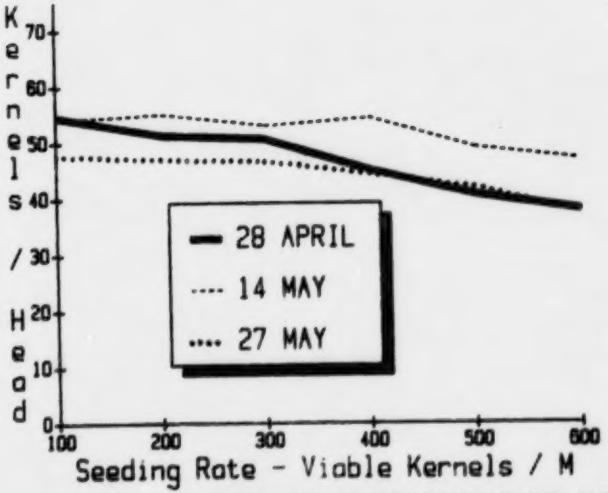

FIGURE 4 - EFFECTS OF SEEDING DATE AND SEEDING RATE ON KERNELS PER HEAD OF CADETTE BARLEY (1987)

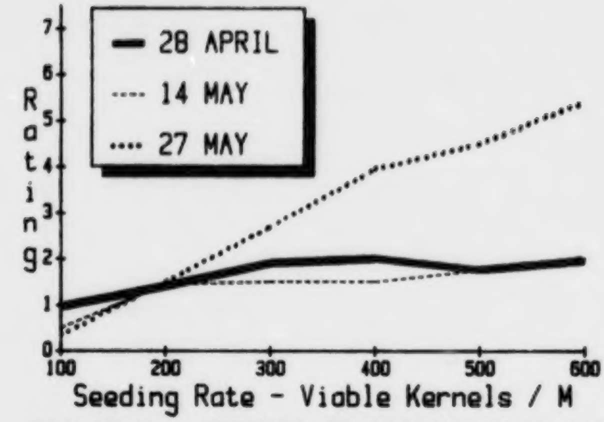

FIGURE 5 - EFFECTS OF SEEDING DATE AND SEEDING RATE ON LODGING OF CADETTE BARLEY (1987)

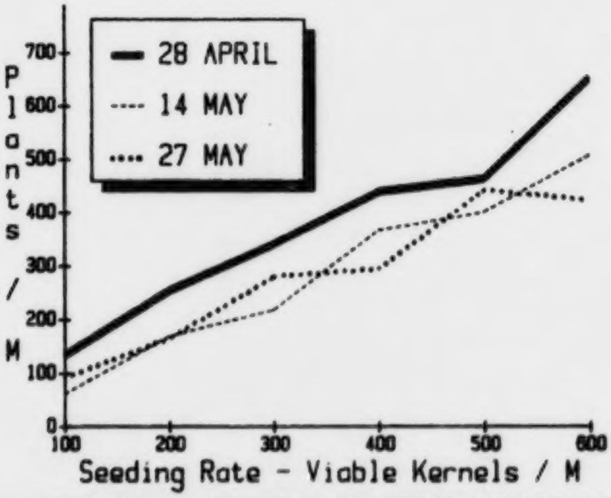

FIGURE 6 - EFFECTS OF SEEDING DATE AND SEEDING RATE ON STAND COUNTS OF CADETTE BARLEY (1987)

POST HARVEST TREATMENTS FOR VETCH (VICIA CRACCA L) CONTROL IN STRAWBERRIES

K.V. McCully and G.D. Macintosh

Abstract: *The effect of clopyralid (0.2 and 0.3 kg(a.i.)/ha and dicamba (0.40 kg (a.i.)/ha) on crop phytotoxicity and vetch (Vicia cracca L) control was evaluated at three post harvest application dates (August 6, September 3, October 7). Vetch control was excellent with both dicamba and clopyralid. The earliest application date was the most phytotoxic to strawberries. The only treatment providing crop phytotoxicity not significant from the untreated plots was clopyralid at 0.2 and 0.3 kg (a.i.)/ha applied at the last application date (Oct. 7). Dicamba was more phytotoxic than clopyralid, particularly at the first application date (Aug. 6).*

TRAITEMENTS APPLIQUÉS APRÈS LA RÉCOLTE AFIN DE LUTTER CONTRE LA CROISSANCE DE LA VESCE (VICIA CRACCA L) DANS LES FRAISES

Résumé : *L'effet de la clopyralide (0,2 et 0,3 kg (i.a.)/ha et du dicamba (0,40 kg (i.a.)/ha) sur la phytotoxicité de la récolte et sur la lutte contre la croissance de la vesce (Vicia cracca L) a été évalué à trois reprises après la récolte (le 6 août, le 3 septembre et le 7 octobre). On est parvenu à maitriser la croissance de la vesce de façon très satisfaisante avec le dicamba et le clopyralide. L'application la plus précoce a entraîné la plus grande phytotoxicité pour les fraises. Le seul traitement qui n'a pas rendu la récolte plus phytotoxique que celle recueillie sur des parcelles non traitées a été la clopyralide à des concentrations de 0,2 et 0,3 kg (i.a.)/ha appliquées tardivement (le 7 octobre). Le dicamba s'est avéré plus phytotoxique que la clopyralide, particulièrement à la première date d'application (le 6 août).*

INTRODUCTION: The need for effective weed control in commercial strawberry plantings is still of great concern to New Brunswick growers today. The control of tufted vetch (Vicia cracca L) is of particular concern since it frequently escapes standard weed control practices. Two herbicides which warrant study in the area are dicamba and clopyralid. If an optimal time for Vetch control with minimal crop damage can be determined with these herbicides, vetch escapes may be controlled. This trial was initiated to evaluate the effectiveness and efficiency of dicamba and clopyralid on the control of tufted vetch, with minimal crop damage, at three different post harvest application dates.

MATERIALS AND METHODS: This trial was established in a commercial strawberry field at Waterborough, Queen's County, N.B. The field had been planted in 1986 and had a pH of 4.8 and an organic matter level of 2.3%. Standard weed control practices had been used prior to this trial. The cultivar used was Annapolis. Plots were arranged as a split plot experiment in a randomized complete block design. Treatments were replicated four times. Plots were a single row 1 m x 6 m with 2 m sub plots (timings).

Two rates of clopyralid (0.2 and 0.3 kg (a.i.)/ha) and one rate of dicamba (0.40 kg (a.i.)/ha) were applied at three different post-harvest timings: 5 days prior to mowing (August 6), after mowing (September 3) and on October 7. Sprays were applied using a CO_2 backpack sprayer delivering 223 l/ha at a pressure of 207 kPa.

Crop injury and vetch control were assessed on a visual rating scale of 0-100, where 0 represented no crop damage or vetch control and 100 represented crop death or 100% vetch control. Crop injury and vetch control was assessed periodically after initial application timings. An analysis of variance was conducted on the data and means separated by Duncan's Multiple Range Test.

Further crop injury and vetch control ratings will be performed in the 1988 growing season and the effect of the treatments on yields will also be evaluated.

RESULTS AND DISCUSSION: Due to lateness in the season, vetch control was not assessed for the last application date, but will be assessed next season. Excellent vetch control was obtained, however, from the first two application dates, from both clopyralid and dicamba treatments (see Table 1). Crop phytotoxicity was however a problem with the treatments and different timings.

The first application timing (August 6) resulted in significantly more crop phytotoxicity than the September 3 and October 7 application dates with both herbicides. The latter two dates were not significantly different from each other for overall treatment phytotoxicity.

All treatments resulted in significantly more crop damage than the untreated plots for the first two application timing dates (August 6 and September 3). Clopyralid applied at either rate during the last application timing (October 7) was the only treatment timing that was not significantly different from the untreated plots when evaluating crop phytotoxicity.

Dicamba was the most phytotoxic treatment over all the timings, but was only significantly different from the clopyralid rates during the first application date. When evaluating crop phytotoxicity, the two clopyralid rates were not significantly different from one another irregardless of the application date.

Damage was higher than expected from all treatments at the different application dates. This was particularly true for the first timing. It is believed, at this time, the plants were under a great deal of moisture stress from the month of July (22% of normal rainfall) and therefore more susceptible to herbicide damage. Mowing of the plants five days later put the plants under further stress and resulted in higher than expected crop phytotoxicity. By the last two timing dates, the plants were not under as much stress and although crop phytotoxicity was lower, it was still higher than expected. It is possible that the low pH of 4.8 and the low organic matter level of 2.3% may have influenced the herbicides performance over all the application dates as well. The herbicides may not have degraded as rapidly with the low pH, and binding of the herbicides to organic matter would be minimal. This would leave more herbicide unbound and free to be taken up by the plants.

CONCLUSION: Clopyralid and dicamba provided excellent vetch control, but crop damage was higher than expected. The only treatment-timing combination which resulted in crop damage not significant from the untreated plots was clopyralid at the 0.2 and 0.3 kg (a.i.)/ha rate applied on October 7. The earliest timing of August 6 resulted in the most crop damage, but it is believed that strawberry moisture stress was responsible for the more pronounced damage. Dicamba was more phytotoxic than clopyralid, but not always significantly. The pH, organic matter and moisture stress may have influenced results and caused the higher than expected crop damage levels on all the timings.

ACKNOWLEDGEMENTS: The authors would like to thank Steven Ferris for the use of his land required for this study and Douglas Doohan (N.S.D.A.M.) for suggested treatments and application timings.

Table 1: Effect of Herbicide Treatments on Crop Phytotoxicity and Vetch Control Over 3 Different Application Timings.

Application Timing	Trt	Rate kg(a.i)/ha	Crop* Phyto %	Vetch* Control %
1. August 6**	Control	-	0.0 a	0.0 a
	Clopyralid	0.2	55.0 d	100 b
	Clopyralid	0.3	65.0 d	100 b
	Dicamba	0.4	93.8 e	100 b
2. September 3	Control	-	0.0 a	0.0 a
	Clopyralid	0.2	17.5 bc	100 b
	Clopyralid	0.3	20.0 bc	100 b
	Dicamba	0.4	32.5 c	100 b
3. October 7	Control	-	0.0 a	N/A
	Clopyralid	0.2	15.0 ab	N/A
	Clopyralid	0.3	12.5 ab	N/A
	Dicamba	0.4	20.0 bc	N/A

N/A - not available
*0 - represents no crop phytotoxicity or no vetch control
100 - represents crop death or 100% vetch control

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2. September 3	Control	-	0.0 a	0.0 a
	Clopyralid	0.2	17.5 bc	100 b
	Clopyralid	0.3	20.0 bc	100 b
	Dicamba	0.4	32.5 c	100 b
3. October 7	Control	-	0.0 a	N/A
	Clopyralid	0.2	15.0 ab	N/A
	Clopyralid	0.3	12.5 ab	N/A
	Dicamba	0.4	20.0 bc	N/A

N/A - not available
*0 - represents no crop phytotoxicity or no vetch control
100 - represents crop death or 100% vetch control

* - data are averages of four replications. Mean followed by the same letters are not significantly different at the P=0.05 level according to Duncan's Multiple Range Test.

** - data presented was collected 42 days after first treatment timing (Aug. 6). 34 days after second treatment timing (Sept. 3) and 44 days after third treatment timing (October 7).

PERENNIAL WEED CONTROL IN FIELD ESTABLISHED FIDDLEHEADS

K.V. McCully and G.D. Macintosh

Abstract: *Trials were conducted to evaluate various herbicides, rates, and timings of application in order to reduce establishment time and hand cultivation requirements in field plantings of ostrich (fiddlehead) fern. Preliminary results have shown that simazine and terbacil sprays would not be suitable. Promising treatments include dormant sprays of glyposate, dicamba and clopyralid at rates of 2.0, 0.4 and 0.4 kg/ha (a.i.) respectively.*

LUTTE CONTRE LES MAUVAISES HERBES VIVACES DANS LES CHAMPS DE CROSSES DE FOUGÈRE CULTIVÉS

Résumé : *Des essais ont été effectués afin d'évaluer différents herbicides ainsi que différents taux et dates d'application dans le but de réduire la période de culture et les travaux de sarclage manuels dans les champs de crosses de fougère cultivés. Les résultats préliminaires indiquent que des pulvérisations de simazine et de terbacile ne conviennent pas. Les traitements les plus prometteurs comprennent des pulvérisations de glyposate, dicamba et clopyralide à des taux de 2,0, 0,4 et 0,4 kg/ha (i.a.) respectivement lorsque les plants sont dormants.*

INTRODUCTION: If cultivated fiddleheads are to become a commercially viable crop, then a complete production system must be developed. This includes the development of a complete and economical weed control program. At present, weed control is achieved predominantly by hand and mechanical cultivation, which is both time consuming and costly. This study has been initiated with the aim of determining which herbicides, rates and timings of application would be best suited to this crop.

MATERIALS AND METHODS: This trial was established at the New Brunswick Horticulture Centre, Hoyt, N.B. Fiddleheads were planted on June 19, 1986, mulched with sawdust and allowed to establish for the rest of the season. Sprays (see Table I) were applied on May 11, (prior to the onset of active growth), September 4, and November 19, 1987 using a CO2 backpack sprayer delivering a volume of 151.5 l/ha at a pressure of 207 kPa.

A second trial to assess herbicides applied in the establishment year was also conducted. Sprays (see Table II) were applied on various dates in 1986 to a new planting using a randomized complete block design.

DISCUSSION: Trial I: Weed control on the first timing, was assessed on July 3, 1987 (53 days after treatment). At this time, all but the 2,4-D treatment exhibited better weed control than the control. This data proved to be significant when subjected to an analysis of variance. Treatments of dicamba at both rates (0.2 and 0.4 kg/ha), glyphosate at 2.0 kg/ha and clopyralid at 0.4 kg/ha provided good control. No injury to the crop was observed on this date.

Later weed control ratings were not possible due to hand weeding of the plot area, however, ratings will be made in 1988. Dicamba did cause a slight phytotoxic effect at the September 4 treatment date, but the plants appear to have grown out of it.

Trial II: The second trial on fiddlehead treatments in the establishment year has yielded disappointing results. When assessed for weed control and survival on July 3, 1987, only the terbacil treatments showed any residual control and the ferns in those plots had been severely injured or killed. Injury has also been observed with simazine sprays in the past.

CONCLUSION: Although more data must be collected from this trial to form any firm conclusions, it appears that the dormant sprays of glyphosate, dicamba and clopyralid (at rates of 0.4, 0.4 and 2.0 kg/ha respectively) will provide good control of perennial weeds in field-established fiddleheads with minimal crop damage.

TABLE I. Perennial Weed Control in Established Fiddleheads

TREATMENT	RATE kg(a.i.)/ha	PERCENT * WEED CONTROL (after 53 days)	PERCENT CROP DAMAGE (after 53 days)
1. Control		2.5 D	0
2. Dicamba	0.2	52.5 AB	0
3. Dicamba	0.4	63.75 AB	0
4. Clopyralid	0.2	37.5 BC	0
5. Clopyralid	0.4	57.5 AB	0
6. Glyphosate	2.0	71.25 A	0
7. 2,4-D	0.5	12.5 CD	0
LSD .05		31.04	N.S.

Date of application: 11 May 1987

*0 = no weed control
100 = complete weed control

TABLE II Weed Control in Establishment Year.

TEATMENT	RATE kg(a.i.)/ha	TIMING	% WEED CONTROL July 3/87	% SURVIVAL July 3/87
Control			0.0 B	100.0 A
Simazine	1.0	23/06/86	20.0 B	87.5 A
Terbacil	1.0	23/06/86	73.75 A	0.0 C
Simazine	1.0	10/09/86	0.0 B	100.0 A
Terbacil	1.0	10/09/86	62.5 A	47.5 B
Simazine	0.5	10/09/86	0.0 B	100.0 A
	0.5	16/10/86		
Terbacil	0.5	10/09/86	0.0 B	100.0 A
	0.5	16/10/86		
Glyphosate	2.0	23/06/86	0.0 B	100.0 A
Sethoxidim	0.8	10/09/86	0.0 B	100.0 A
LSD .05			22.7	21.4

HERBICIDE EVALUATION ON JUNIPERS

D.J. Doohan, K.V. McCully, and G.D. Macintosh

Abstract: *Juniper shrubs were treated with spring-applied oxyflurofen alone and in combination with simazine. Results indicate that weed control is best when the two herbicides are used in combination at a rate of 1.0 kg(a.i.)/ha each. Better growth was observed with plants treated with the combined treatments and with the high rate (1.0 kg/ha) of oxyflurofen alone.*

ÉVALUATION DES HERBICIDES SUR LES GENÉVRIERS

Résumé : *Des arbustes de genévrier ont été traités au printemps à l'oxyflurofen seulement, puis à l'oxyflurofen additionné de simazine. Les résultats indiquent que la lutte contre les mauvaises herbes est plus efficace lorsque les deux herbicides sont utilisés en combinaison à un taux d'application de 1,0 kg (a.i.)/ha chacun. Les arbustes qui ont connu la croissance la plus intéressante ont été ceux traités avec une combinaison des deux produits et ceux traités avec le taux le plus élevé (1,0 kg à l'hectare) d'oxyflurofen seulement.*

INTRODUCTION: The production of ornamental nursery stock is an expanding industry in New Brunswick, however, one of the factors limiting its expansion is the lack of effective weed control programs. To assist in this area, an evaluation of two herbicides (oxyflurofen and simazine) at various rates and tank mixes was initiated to evaluate their effects on weed control and crop tolerance.

MATERIALS AND METHODS: This trial was established at the New Brunswick Horticulture Centre, Hoyt, N.B. Four blocks, with each plot consisting of one row with four juniper plants were planted on September 20, 1985 in a randomized complete block design. Plants were spaced 50 cm apart within the rows. Rows were spaced 3 metres apart to facilitate mechanical cultivating. Sprays (see Table) were applied prior to the onset of active growth on June 10, 1986, using a CO2 backpack sprayer delivering a volume of 152 l/ha at a pressure of 207 kPa. Duplicate sprays were applied on June 18, 1987. Weed control was assessed on July 3, (15 days after application) and September

1, 1987 (75 days after application), and diameters measured on November 17, 1987. An analysis of variance was performed on this data and least significant differences were calculated.

DISCUSSION: Rates of oxyflurofen at 0.5 kg/ha and below provided poor weed control at both assessment dates. The high rate of 1.0 kg/ha did provide fair control on July 3 (15 days after application) and some residual control was evident on September 1 (75 days after application). However, this was not significantly different from the control.

All rates of oxyflurofen in combination with simazine did give fair to good control 15 days after application and still had some residual affects when assessed after 75 days. Only the high rate of oxyflurofen, tank mixed with simazine provided significantly better control throughout the growing season, however, overall weed control appears to have been poorer this year, compared to last.

Diameter appears to be related to the treatments as well. Juniper plants treated with the high rate of oxyflurofen (1.0 kg/ha) alone and tank mixes of simazine and oxyflurofen at rates of 0.25 kg/ha and above were significantly larger than the control when assessed on November 17, 1987.

CONCLUSION: Of the various rates and combinations of materials used in this trial, the treatments which produced the best results for juniper growth were the high rate of oxyflurofen (1.0 kg/ha) alone and the tank mixes of simazine (1.0 kg/ha) and oxyflurofen (0.25 to 1.0 kg/ha). Optimum season-long weed control was obtained only with the combination of simazine and oxyflurofen at 1.0 kg/ha each.

This project was supported by the Agri-Food Development Agreement.

Table. Summary of Weed Control and Juniper Growth, 1987

Treatment	Rate kg(ai)/ ha.	% Weed * Control 15 days after application	% Weed Control 75 days after application	Diameter Nov. 17/87 (cm)
1.Control		0.0 D	0.0 B	63.3 D
2.Oxyflurofen	0.125	5.0 D	7.5 B	69.9 CD
3.Oxyflurofen	0.25	10.0 D	10.0 B	65.9 D
4.Oxyflurofen	0.5	20.0 CD	5.0 B	68.9 CD
5.Oxyflurofen	1.0	45.0 ABC	22.5 B	79.6 ABC
6.Oxyflurofen Simazine	0.125 1.0	22.5 CD	22.5 B	74.4 BCD
7.Oxyflurofen Simazine	0.25 1.0	60.0 AB	22.5 B	90.8 A
8.Oxyflurofen Simazine	0.5 1.0	27.5 BCD	27.5 B	80.8 ABC
9.Oxyflurofen Simazine	1.0 1.0	61.2 A	60.0 A	85.8 AB
LSD .05		33.2	32.3	12.5

* 0 represents no weed control
100 represents complete weed control
- means with the same letter are not significantly different.

HERBICIDE EVALUATION ON FIELD GROWN SHADE TREES

D.J. Doohan, K.V. McCully and G.D. Macintosh

Abstract: *Simazine, oxyflurofen, and oryzalin were tested on Tilia cordata and Malus sp. whips. Malus trees were discarded due to heavy damage by deer. Tilia survived the treatments well and growth did not appear to be affected. Spring applied simazine in combination with fall applications of oxyflurofen or oryzalin provided good residual control throughout the entire 1986 growing season. Only oxyflurofen at 4.0 kg(a.i.)/ha provided good control in 1987. Lower rates provided only fair control as did simazine and oryzalin.*

ÉVALUATION DES HERBICIDES SUR LES ARBRES D'OMBRAGE CULTIVÉS EN PLEIN CHAMP

Résumé *: On a procédé à des essais d'application de simazine, d'oxyflurofen et d'oryzaline sur les espèces Tilia cordata et Malus. Les arbres de l'espèce Malus ont été jetés, car les cerfs les avaient trop endommagés. Les arbres de l'espèce Tilia ont bien survécu au traitement et il ne semble pas y avoir eu d'effets sur leur croissance. L'application de simazine au printemps combinée à des applications d'oxyflurofen ou d'oryzaline à l'automne a assuré une bonne répression résiduelle des mauvaises herbes pendant toute la saison de croissance 1986. Seul l'oxyflurofen, à raison de 4,0 kg (a.i.) à l'hectare a donné de bons résultats en 1987. À des concentrations plus faibles, ce produit n'a donné que des résultats moyens comme l'avaient fait la simazine et l'oryzaline.*

INTRODUCTION: The need for effective weed control methods in the production of shade trees is of great concern to the ornamental industry in New Brunswick. This trial has been initiated to determine the effectivness and efficiency of several herbicide treatments and timings on weed control and crop damage.

MATERIALS AND METHODS: This trial was established at the New Brunswick Horticulture Centre, Hoyt, N.B. Shade tree whips were planted in a riverbank sandy loam (1.0 % OM, pH 5.8) on May 31 and June 3, 1985. Species used in this trial were Malus sp. and Tilia cordata (Greenspire Linden). Four plants of each species were planted 50 cm apart within the row in each plot, using a randomized complete block design. Sprays (see Table I) were applied on June 18 and November 20, 1985 and June 18, 1987 with a CO2 backpack sprayer, at a pressure of 138 kPa, delivering a spray volume of 251 l/ha.

OBSERVATIONS (1985): Weed control was assessed on July 23, 1985. Height measurements and weed control evaluations were performed on October 4, 1985. All treatments provided good weed control throughout the growing season, with the exception of the oryzalin treatment which did not provide lasting control. Oxyflurofen appeared to have the best control. Simazine gave adequate control, but significantly less than oxflurofen. No significant differences in growth or vigor were observed between any of the treatments. (See Doohan and Macintosh, 1985)

OBSERVATIONS (1986): Weed control was assessed on June 3 and October 7, 1986. Survival ratings were assessed on June 17 and October 16. *Tilia* height was measured on October 16. *Malus* whips were not measured due to severe deer damage the previous winter. Simazine applied at rates of 1.0 and 2.0 kg(a.i.)/ha did not give acceptable control during the 1986 growing season. Neither did the treatments of oxyflurofen at 1.0 kg(a.i.)/ha or oryzalin at 2.0 kg/(a.i.)/ha. However, simazine in combination with oxyflurofen or oryzalin (even at the lower rates used) did provide good control throughout the entire growing season. It should be noted that no sprays were applied in 1986. No significant differences in growth or survival of *Tilia* whips were observed. (See Doohan and Macintosh, 1986)

OBSERVATIONS (1987): At the July 3 weed control rating, simazine performed poorly both alone and in combination with oryzalin. The oryzalin treatment also performed very poorly. Oxyflurofen provided good control at the high rate of 4.0 kg(a.i.)/ha, but did not work as well at the 2.0 kg(a.i.)/ha rate and performed poorly at the low rate of 1.0 kg(a.i.)/ha. On September 1, ratings were quite similar. The simazine and oryzalin treatments were still giving only fair control (oryzalin provided very poor control at 2.0 kg(a.i.)/ha. Oxyflurofen treatments were performing much the same as at the earlier rating date. Good control was obtained with the

TABLE I. Treatments for Field Grown Shade Trees.

TREATMENT	RATE / kg(a.i.)/ha June 18/85	DATE OF APPLICATION Nov. 20/85	June 18/87
1) Simazine	2.0		2.0
2) Simazine	2.0	1.0	2.0
3) Simazine	1.0		1.0
Oxyflurofen		1.0	
4) Simazine	1.0		1.0
Oryzalin	2.0		2.0
5) Oxyflurofen	1.0		1.0
6) Oxyflurofen	2.0		2.0
7) Oxyflurofen	4.0		4.0
8) Oxyflurofen	1.0	1.0	1.0
Simazine		1.0	
9) Simazine	1.0		1.0
10) Oryzalin	2.0		2.0
11) Control	-	-	-
12) Control	-	-	-

TABLE II. 1987 Weed Control Ratings.

TREATMENT	% WEED CONTROL July 3/87	% WEED CONTROL Sept. 1/87
1.	17.5 DE	70.0 AB
2.	52.5 BC	62.5 AB
3.	57.5 BC	80.0 AB
4.	40.0 BCD	65.0 AB
5.	37.5 CD	50.0 BC
6.	70.0 AB	67.5 AB
7.	92.5 A	92.5 A
8.	55.0 BC	52.5 BC
9.	5.0 E	52.5 BC
10.	12.5 DE	27.5 CD
11.	0.0 E	0.0 D
12.	0.0 E	0.0 D
LSD .05	32.0	34.5

higher rate of 4.0 kg(a.i.)/ha, fair control at 2.0 kg(a.i.)/ha and poor control at 1.0 kg(a.i.)/ha. No significant differences in height or circumference were observed between any of the treatments. This is likely due to severe snow damage the previous winter.

CONCLUSION: It would appear that combinations of spring applied simazine and fall applied oxyflurofen or oryzalin provide the best performance of the treatments tested in this trial over the 3 years.

The above treatments performed better than oxyflurofen or oryzalin alone, perhaps with the exception of the high rate of oxyflurofen (4.0 kg(a.i.)/ha.

REFERENCES: Doohan, D.J. and G. Macintosh, 1985. Herbicide evaluation on field grown shade trees. Adapt. Resch. Rept. Vol. 7, New Brunswick Department of Agriculture.

Doohan, D.J. and G. Macintosh, 1986. Herbicide evaluation of field grown shate trees. Adapt. Resch. Rept. Vol. 8, New Brunswick Department of Agriculture.

This project was supported by the Agri-Food Development Agreement.

NEW BRUNSWICK CEREAL WEED SURVEY UPDATE

K.V. McCully and D.J. Doohan

Abstract: In 1987 a total of 113 cereal fields were surveyed for weeds over 88 farms in New Brunswick. Results are presently being analyzed. Information obtained from a questionnaire on farming practices given on each farm is discussed in relation to weed composition and densities.

MISE À JOUR DE L'ENQUÊTE SUR LES MAUVAISES HERBES DANS LES CHAMPS DE CÉRÉALES AU NOUVEAU-BRUNSWICK

Résumé : En 1987, 113 champs de céréales situés sur 88 exploitations agricoles du Nouveau-Brunswick ont été étudiés afin d'y répertorier les mauvaises herbes. Les résultats sont actuellement en cours d'analyse. Les renseignements, obtenus au moyen d'un questionnaire sur les pratiques agricoles de chaque exploitation, sont analysés en relation avec la densité des mauvaises herbes et les variétés répertoriées.

INTRODUCTION: Concerns over the distribution and abundance of weeds throughout New Brunswick cereal fields led to the initiation of a three year weed survey beginning in 1985. The predominant weed species being monitored was wild oats, which was appearing in Restigouche County cereal field. Its abundance and distribution throughout the province was not known and it was felt that this information was necessary in order to help direct research and extension efforts. Losses from wild oats such as yield reduction, dockage, cleaning costs, and lowering of grade and quality, are well recognized. Wild oats is one of the most troublesome weeds of Western Canada (Banting, 1980).

In trying to determine why particular weeds are more serious than others, a questionnaire was given to each farm visited. Questions asked included: 1) Crop being grown? 2) Was manure used? 3) Type of seed used? 4) Rotation used? 5) Herbicides used last year? and 6) Herbicides used this year? Observations as to how these practices influenced the weed population and composition will be discussed.

RESULTS AND DISCUSSION: The survey was conducted in counties where the most grain was produced. For example, if a county produced 40% of the provinces total grain, close to 40% of the total fields surveyed would be in this county. (See Table I)

Of the fields surveyed in New Brunswick, it was determined that barley accounted for 42.5% of the total fields surveyed, followed by oats, 37.2%, wheat 17.7%, rye 0.9% and triticale 0.9%. Of these fields, a number were underseeded (Table II), and as a result usually had lower weed densities due to increased competition.

A total of 59 different weed species were identified in barley fields, 63 in oat fields and 45 in wheat fields. The lower weed composition in wheat fields can be accounted for by the increased planting of the new Max milling wheat. Since the milling wheat gives a higher monetary return than feed grains and requires more management, this wheat was put into the farmers cleanest, weed - free ground. Although the weed composition was less in the fields planted to wheat, it is felt that there would be little difference in the weed composition between the different grains, all things being equal. However, weed densities may vary.

Weed composition and density may be influenced by the use of manure. In New Brunswick 13.3 % of the fields surveyed had manure applied in the spring. Although analysis is not complete, it appears that these fields treated with manure did have a higher weed infestation.

The use of common seed from previous years crops also resulted in greater weed abundance than fields planted with certified or registered seed. Slightly over 60% of New Brunswick growers planted common seed, 34.5% planted certified seed and 5.3% registered seed. The need to plant weed free seed is very important to keep weed populations to a minimum.

Rotations greatly influenced the weed population and composition levels in grain fields. The best rotation found was the potato - grain rotation. This rotation involved a row crop rotated with a field crop thereby using different management principles and chemicals. Cultivation, hilling, herbicides and top killing, keep potato fields relatively weed free, and control the following year is usually very good. The worst rotation used was from sod ground (hay) to grain where weed populations were high. Poor weed control resulted from improperly prepared and worked soil before planting. A list of the top 10 rotations used in New Brunswick is presented in Table III.

Improper selection and use of herbicides can also influence the weeds present in grain fields. In New Brunswick, MCPA was the most commonly used herbicide, being sprayed on 54% of the fields surveyed (see Table IV). 2,4-D was the next most commonly used herbicide, being sprayed in 6.2% of the fields surveyed. A large number of weeds appear to be escaping these two herbicides. Alternative herbicides or tank mixes with other herbicides will have to be used on these hard to control escape weeds.

From the survey it was found that wild oat population levels are being reduced in Restigouche County. In 1985, 21.7% of the fields in Restigouche County were infested, whereas in 1987 only 7.7% of the fields were infested. The mean wild oat density in 1985 was 13.3 plants per meter square, whereas in 1987 densities were down to 1.1 plants per meter square. Financial assistance to encourage wild oat control in the area through summer fallowing, cover cropping, roguing, green chopping and/or chemicals can be attributed to the successful wild oat reduction. To be completely successful, this program will need to be continued for another 5-7 years.

Data on which weeds were the most abundant is currently being analyzed by Agriculture Canada in Regina, Saskatchewan and will be presented and discussed in the 1988 Adaptive Research Reports.

CONCLUSION: Underseeded grain fields had lower weed densities than fields not underseeded. Increased competition between the weeds and crop would account for this. Wheat fields had the lowest weed composition of the different grains, but planting of the new max milling wheat in the farmers best land is likely responsible for this. Fields with manure applied appear to have more weeds. Growers using improperly cleaned common seed from previous years had more weeds than growers using

TABLE I

Number of Fields Surveyed in Each County

Restigouche	13	Albert	1
Madawaska	9	Westmorland	6
Victoria	15	Kent	5
Carleton	40	Northumberland	2
York	13	Gloucester	2
Sunbury	1	St. John's	0
Queens	1	Charlotte	0
Kings	5		113 fields on 88 farms

TABLE II

Percentage of Grain Fields Surveyed

Barley	42.5 %	of which 15.9 % underseeded
Oats	37.2 %	of which 16.8 % underseeded
Wheat	17.7 %	of which 3.5 % underseeded
Rye	0.9 %	----
Triticale	0.9 %	----

TABLE III

Top Ten Grain Rotations Used in N.B.

Potato - Grain	31.9 %
Grain - Grain	22.1 %
Hay - Grain	21.2 %
Alfalfa - Grain	3.5 %
Corn - Grain	2.7 %
Tobacco - Grain	1.8 %
Kale - Grain	1.8 %
Peas - Grain	0.9 %
Rye Grass - Grain	0.9 %
Unknown -	9.7%

TABLE IV

Herbicides Used in N.B. Cereal Fields

	% fields using		% fields using
MCPA	54.0	MCPA + dicamba	0.9
2,4-D	6.2	MCPA + diallate	0.9
MCPA + Cyanazine	2.7	MCPA + 2,4-DB	0.9
MCPB	2.7	MCPB + 2,4-D	0.9
2,4-DB	1.8	Unknown/none	27.4
MCPA + 2,4-D	1.8		

certified or registered seed. Rotations also greatly influenced weed composition and densities. Potato - grain rotations were the most effective rotation for weed control in N.B., whereas hay - grain was the worst. Use of improper herbicides, improper herbicide timing and resistant weeds all influenced weed densities and composition.

REFERENCES: Doohan, D., A.G. Thomas, and S. Bower, 1986. Cereal Weed Survey 1985. Adap. Res. Rept. N.B.D.A.R.D. 8 : 107-121.

Banting, J.D. 1980. Growth habit and control of Wild Oats - Pub. 1531. Agriculture Canada, Ottawa.

OPERATION SPRAYCHECK

K.V. McCully and G.D. Macintosh

Abtract: *A sprayer calibration program, initiated in 1986, was offered again in 1987 to help growers to identify and correct problems resulting from poor sprayer performance. Of the 14 sprayers reported on, only six machines (42 %) were found to be calibrated to an acceptable level. Application errors ranged from less than 1 % to 51 %.*

ESSAIS DE VÉRIFICATION DES PULVÉRISATEURS

Résumé : *Un programme de calibrage des pulvérisateurs, entrepris en 1986, s'est poursuivi en 1987 afin d'aider les cultivateurs à cerner et à rectifier les problèmes résultant du piètre rendement des pulvérisateurs. Sur les quatorze pulvérisateurs faisant l'objet du présent rapport, seuls six (42 %) étaient calibrés d'une manière acceptable. Les erreurs d'application variaient de moins de 1 % à 51 %.*

INTRODUCTION: One crop production area which is frequently overlooked is that of accurate pesticide application. Errors can and often do occur in calibration of sprayers and in the mixing of pesticides prior to spraying. This often results in dollars wasted and inefficient pesticide performance. In the spring of 1986 an extension program entitled "Operation Spraycheck" was initiated by the Plant Industry Branch. The objectives of this program were to demonstrate correct sprayer calibration, sprayer problem diagnosis and the cost of misapplication. This program has been continued in the 1987 growing season and has met with favourable responses from growers participating in the clinics.

MATERIALS AND METHODS: Equipment for this program, developed by the Montana State University in 1982 was obtained by the Plant Industry Branch in the spring of 1986. This included a "sprayer pattern table" and computer software designed to assess the performance of each individual sprayer.

Six clinics were held in St. Quentin, Buctouche, Rogersville, Cocagne, Tracadie and Belledune between June 2 and June 25, 1987. It has been found that three or four sprayers can be handled in an afternoon or evening. About 35 growers attended the clinics in both Tracadie and Belledune.

At the beginning of each clinic a brief introduction was made about the importance of proper sprayer calibration, and about the "Spraycheck" program. The "spray pattern table" was then used on each sprayer to determine the optimum boom height, and identify nozzles which were the improper type, size, or badly worn or damaged. This table had two inch wide grooves which would spill into graduated cylinders across the width of the sample area. When the table was tipped on edge, the volume differences across the boom could be identified.

Each farmer was then asked to fill out a questionnaire concerning the type of equipment used, type of pump, size and type of nozzle tips, and the pesticides he intended to use, their rates and prices, and the water output he expected.

Next, the pressure guage was checked against a standard guage to test its accuracy. The pressure at various locations on the boom was also tested to determine if there was a drop in pressure in any of the lines. Thw flow rates were then measured for each individual nozzle across the boom. Finally, the farmer was asked to run his machine over a measured distance in order to calculate the exact velocity while spraying.

All this information was then entered into the portable computer. The computer printout would compare the expected performance to the actual performance of the sprayer and make recommendations for improving application accuracy. These recommendations could include a new nozzle size, pressure, velocity, or tank mix.

Finally, the printout would show the expected versus actual costs. If an over application was occurring, the printout would show how much money was being wasted for each hectare sprayed.

CONCLUSION: Of the fourteen sprayers tested during this season, four had nozzle errors which were too large to calibrate with. Six of the remaining were calibrated to an acceptable level of accuracy (less than 10 % error). This means that only 42 % of the sprayers tested this year were calibrated to a reasonable level of accuracy. The largest error found was a 51% under-application, the best sprayer had less than one percent error. Clearly, more attention must be paid to this problem.

This project was supported by the Agri-Food Development Agreement.

COMPARISON OF DIQUAT AND LIQUID CYANAMID AS POTATO TOP DESSICANTS

K.V. McCully and G.D. Macintosh

Abstract: *Diquat and liquid cyanamid were compared in a commercial potato field for their effectiveness as potato top dessicants. Assessments on leaf and stem dessication were taken 3, 7, 10, 14 and 21 days after application. Yields and stem end necrosis were also taken on the last assessment date. Diquat was faster reacting than liquid cyanamid, but by the final assessment date, leaf dessication was not signficantly different for either treatment. Stem dessication, yields and stem end necrosis were not significantly different from the control for any treatments. Liquid cyanamid appeared to be as effective as diquat for a potato top dessicant.*

COMPARAISON ENTRE LE DIQUAT ET LE CYANAMIDE LIQUIDE COMME DÉFANANT

Résumé : *Du diquat et du cyanamide liquide ont été appliqués dans un champ de pommes de terre commercial, puis l'efficacité respective des deux produits comme défanants a été comparée. Des évaluations du stade de dessiccation des feuilles et des tiges ont été effectuées 3, 7, 10, 14 et 21 jours après l'application. Les rendements obtenus et la nécrose du bout de la tige ont également été évalués à la dernière date d'évaluation. Le diquat agit plus rapidement que le cyanamide liquide, mais à la dernière date d'évaluation, la dessiccation des feuilles ne comportait aucune différence significative avec un traitement ou l'autre. La dessiccation des tiges, le rendement et la nécrose du bout de la tige ne présentaient aucune différence significative avec les résultats obtenus dans les champs témoins pour l'un ou l'autre traitement. Le cyanamide liquide a semblé être aussi efficace que le diquat comme défanant.*

INTRODUCTION: The use of top killers to facilitate potato harvesting, reduce chances of disease incidence, to control tuber size and reduce skinning, is a common practice in New Brunswick commercial potato fields. One of the most common top killers utilized in N.B. is diquat (Reglone TM). Liquid cyanamid has been used as a top killer in various crops for years, but has never been widely accepted for potatoes. Liquid cyanamid is currently being re-evaluated by Cyanamid Canada to compare its effectiveness with diquat and determine if it can be used as an effective alternative. This trial was therefore initiated to compare liquid cyanamid with diquat for potato top dessication.

MATERIALS AND METHODS: The trial was established in a commercial planting of Russet Burbank potatoes in Coldstream, Carleton County, N.B. Potatoes were planted May 24, 1987 in a clay loam soil having a pH of 4.9 and an organic matter level of 2.86%. The experimental design was a randomized complete block with three, 5 m long rows contained within each plot. Results were taken from the centre row, allowing the two outer rows to serve as guards. Treatments (see Table 1) were applied September 8, 1987 with a CO_2 back pack pressure sprayer, in 532 L water/ha at a pressure of 207 kPa. Rainfall levels 5 days before application was 0 mm and 42.0 mm, 2 days after.

Percent leaf and stem injury were assessed 3, 7, 10, 14 and 21 days after initial treatment. Yields were taken 21 days after treatment from the center row in each plot, and stem end necrosis was evaluated. Data was subjected to an anaylsis of variance and means separated by an L.S.D. test.

RESULTS AND DISCUSSION: Diquat was faster reacting than the liquid cyanamid on leaf dessication and was significantly different until the later assessment dates of 14 and 21 days after application (see Table I). A faster kill is not always a desirable quality however, as a slower kill will produce higher quality tubers and allow additional sizing (Advisory Committee on Potatoes, 1984). By the final assessment date, both treatments resulted in significantly more leaf dessication than the untreated control plots. Diquat resulted in significantly more leaf dessication than the untreated control for all assessment dates, whereas liquid cyanamid was only significantly different for the 7, 10 and 21 days after application. Rainfall within twelve hours of treatment application did not appear to influence results to a great extent. It is possible, however, that the slow response of liquid cyanamid on leaf dessication may have been influenced by the rainfall.

Table 1. Percent Leaf Dessication

Trt	Rate Kg (a.i.)/ha	% dessication at days after application				
		3	7	10	14	21
Control	-	22.5	25.0	26.3	52.5	90
Liquid Cyanamid + Agral 90	10+ 0.05% v/v	25.0	47.5	62.5	75.0	97.5
Diquat + Agral 90	0.7+ 0.05% v/v	40.0	72.5	85.0	87.5	100
	LSD 0.05	13.2	18.5	17.5	24.0	4.1

0 - represents no dessication
100 - represents complete dessication

Table 2. Percent stem dessication

Trt	Rate Kg (a.i.)/ha	% dessication at days after application				
		3	7	10	14	21
Control	-	22.5	30.0	37.5	62.5	92.5
Liquid Cyanamid + Agral 90	10+ 0.05% v/v	17.5	35.0	52.5	70.0	96.3
Diquat + Agral 90	0.7+ 0.05% v/v	32.5	45.0	60.0	82.5	98.8
	LSD 0.05	N.S.	N.S.	N.S.	N.S.	N.S.

0 - represents no stem dessication
100 - represents complete stem dessication

Evaluation of treatments on stem dessication, indicated that although stem dessication occurred it was not significantly different from the control at any assessment date (see Table II). It is possible that the foliage was too thick for the spray to penetrate and come in contact with the stem, thereby reducing any stem dessication as a result of the treatments.

Evaluation of yield data indicated no significant differences in yields for any of the treatments. The untreated plots had a yield of 26.9 t/ha, followed by diquat (27.3 t/ha) and liquid cyanamid (30.2 t/ha). None of the treatments displayed any pronounced stem end necrosis.

CONCLUSION: Diquat was faster reacting than liquid cyanamid on leaf dessication. By the final assessment date, both treatments were not significantly different from each other, but did provide more leaf injury than the control. Stem dessication, yields, and stem end necrosis were not significantly different from any of the treatments. From the results it appears that liquid cyanamid can be used as effectively as diquat for potato top dessication.

REFERENCES: Advisory Committee on Potatoes. 1984. Atlantic Canada Potato Guide - Agdex 257-13. Atlantic Provinces Agricultural Services Co-Ordinating Committee.

ACKNOWLEDGEMENTS: The authors would like to thank Barry Shaw for the use of his potato ground required for the trial and Sandy Perley (P.I.B.) for evaluating potato stem end necrosis.

SENSITIVITY OF 8 STRAWBERRY CULTIVARS TO TERBACIL AND SIMAZINE

K.V. McCully and G.D. Macintosh

Abstract: *A trial to evaluate the sensitivity of eight strawberry cultivars to low and high rates of simazine and terbacil was conducted in the spring of 1987. Results indicated that strawberry cultivars were more sensitive to terbacil than simazine. By the final rating period, Mic Mac and Kent were the most sensitive cultivars to the highest rate of terbacil. Significant damage, but to a lesser degree was also observed from Honeoye, Bounty and K81-12 cultivars.*

SENSIBILITÉ DE HUIT CULTIVARS DE FRAISIERS AU TERBACILE ET À LA SIMAZINE

Résumé : *On a procédé à des essais afin d'évaluer la sensibilité de huit cultivars de fraisiers à de faibles et fortes concentrations de simazine et de terbacile au printemps 1987. Les résultats ont indiqué que les cultivars de fraisiers sont plus sensibles au terbacile qu'à la simazine. Lors de la dernière période d'évaluation, les cultivars des variétés Mic Mac et Kent étaient les plus sensibles à des concentrations élevées de terbacile. Des dommages importants, bien qu'à un degré moindre, ont également été observés sur les cultivars Honeoye, Bounty et K81-12.*

INTRODUCTION: Strawberry cultivars being introduced in Atlantic Canada are not screened for herbicide tolerance. As a result, cultivars bred for high yields, large berry size, etc., may not be as vigorous and result in lower than expected yield, when subjected to a growers herbicide program.

Simazine and terbacil are the two most commonly used herbicides in Atlantic Canada strawberry fields. If the cultivars sensitivity to these two herbicides can be determined, herbicide recommendations could be partially based upon the cultivar being grown.

This trail was iniated to determine the sensitivity of both old and new strawberry cultivars to low and high rates of simazine and terbacil.

MATERIALS AND METHODS: The trial was established at the New Brunswick Horticulture Centre, Hoyt, N.B. Eight cultivars, Kent, Mic Mac, Honeoye, Bounty, Glooscap, Veestar, Blomidon and K81-12 were planted June 4, 1987 in a riverbank sandy loam soil. The soil had an organic matter level of 1% and a pH of 5.8. Plants were spaced 37.5 cm apart with a row spacing of 150 cm. Plot size was 3 m x 12 m. Plots were replicated four times in a randomized complete block with a split plot in strips. Treatments included simazine at 500 and 1000 g (a.i.)/ha, terbacil at 250 and 500 g (a.i.)/ha and an untreated control. Treatments were applied July 9, 1987 with a hand held CO_2 pressure sprayer in a water volume of 146 l/ha at a pressure of 207 kPa. Rainfall levels were 0.0 mm 5 days prior to and 0.0 mm 5 days after treatments were applied. Foliar applications of urea were applied weekly from June 15 to August 28, 1987 at 2.25 kg/ha. Visual percent injury ratings were assigned on a scale from 0 to 100 with 0 representing no injury and 100 complete death. Assessment dates were 19 and 55 days after initial treatment. An analysis of variance was conducted on the collected data and means separated by the Duncan's multiple range test. Duplicate sprays were applied November 19, 1987 with survival and yield data to be collected in the spring of 1988.

RESULTS AND DISCUSSION: Although some initial injury was observed from the simazine treatments, damage was not significantly different from the untreated cultivars at either assessment date (see Tables I and II). Results indicated that the cultivars were much more sensitive to terbacil than simazine, particularly at the high rate. By doubling the terbacil rate from 250 to 500 g (a.i.)/ha the percent injury also doubled for most cultivars by the second assessment date. However, the only cultivar which had signficantly more injury as a result of the increased rate was Honeoye.

Initially many cultivars had significant percent injury as compared to the untreated cultivars, but by the final rating period many of the cultivars had recovered. Mic Mac and Glooscap were the most sensitive cultivars at the 250 g (a.i.)/ha terbacil rate when assessed 55 days after initial treatment. Five of the eight cultivars had persistent and occassionally severe injury from terbacil at the 500 g (a.i.)/ha rate. Mic Mac was the most sensitive cultivar, followed by Kent. The guide to chemical weed control for strawberry production in Atlantic Canada states that the margin of safety to the crop is narrower with terbacil than other herbicides and certain varieties like Mic Mac and Bounty are more sensitive than others to terbacil. Honeoye, Bounty and K81-12 also had significant damage, but less than Mic Mac and Kent. Veestar, Glooscap and Blomidon appear to be less sensitive to the 500 g (a.i.)/ha rate of terbacil than the other cultivars.

CONCLUSION: Simazine did not result in any significant damage to any of the cultivars. Cultivars were much more sensitive to terbacil. At the high terbacil rate (500 g a.i./ha), 55 days after treatment, Mic Mac and Kent were the most sensitive cultivars. Honeoye, Bounty and K81-12 also had significantly more damage than the untreated cultivars but less than Mic Mac and Kent. Vee Star, Glooscap and Blomidon appear to be the safest cultivars to use, when terbacil is applied. Lack of rainfall after treatment may have influenced results. It is felt damage would have been more pronounced if higher rainfall levels had occurred.

REFERENCES: Altantic Weed Science Sub Committee. 1982. Guide to Chemical Weed Control for Strawberry Production in Atlantic Canada 1982 - Pub. #1012. Atlantic Provinces Agricultural Services Co-ordinating Committee.

TABLE 1

Strawberry Cultivar Herbicide Tolerance

-19 days after treatment

TRT	RATE g(ai) ha	KENT	MICMACE	HONEOY	BOUNTY	GLOOSCAP	VEESTAR	BLOMIDON	K8112
CONT.		10def*	15n.s	20cdef	10n.s	5ef	10n.s	5ef	0e
SIM.	500	5ef	20n.s	25bcdef	20n.s	20cdef	15n.s	15cdef	10def
SIM.	1000	20cdef	15n.s	15cdef	15n.s	25bcdef	10n.s	15cdef	10def
TERB.	250	15cdef	20n.s	35bcd	25n.s	25bcdef	15n.s	30bcde	40bc
TERB.	500	40bc	40n.s	65a	30n.s	50ab	30n.s	50ab	30bcde

0 represents no crop injury

100 represents death of plant

*Data are averages of four replications. Means followed by the same letter are not significantly different at the P = 0.05 level according to Duncan's Multiple range test.

Table 2. Strawberry Cultivar Herbicide Tolerance
55 days after treatment

TRT	RATE g(ai) ha	KENT	MICMAC	HONEOYE	BOUNTY	GLOOSCAP	VEESTAR	BLOMIDON	K8112
CONT.		0d	0d	0d	0d	0d	0n.s	0n.s	0d
SIM.	500	0d	0d	0d	5cd	0d	0n.s	0n.s	0d
SIM.	1000	0d	0d	0d	0d	0d	0n.s	5n.s	0d
TERB.	250	0d	10c	0d	0d	10c	5n.s	0n.s	5cd
TERB.	500	30b	40a	10c	10c	0d	0n.s	0n.s	10c

0 - represents no crop injury
100 - represents death of plant

Data are averages of four replications. Means followed by the same letter are not significantly different at the P=0.05 level according to Duncan's Multiple Range Test.

EVALUATION OF FUNGICIDES FOR CONTROL OF POWDERY MILDEW ON STRAWBERRIES

K.V. Lynch and S.J. LeBlanc

Abstract: *Three fungicides programs were evaluated for powdery mildew suppression on Veestar strawberries. All three showed no effect on the suppression of the disease.*

ÉVALUATION DES FONGICIDES SUR LA RÉPRESSION DU BLANC DES FRAISIERS

Résumé : *L'efficacité de trois programmes d'application de fongicides pour l'élimination du blanc sur les fraisiers de type "Veestar" a été évaluée. Aucun des trois fongicides n'a eu d'effet bénéfique quant à l'élimination de cette maladie.*

INTRODUCTION: Severe foliar infection by powdery mildew, damages leaves, reduces photosynthesis and increases transpiration, because of a thick covering of mycelium, necrosis or even defoliation. The reduction in photosynthesis is suspected to reduce yields the following spring. This work is a preliminary evaluation of three fungicide programs.

MATERIALS AND METHODS: Veestar strawberries in their third year of production were arranged in a six replicate randomized complete block design. Fungicides and rates were: Benlate 50 WP (Benomyl) 0.55 a.i. kg/ha, microfine sulfur 4.14 a.i. kg/ha and Easout 70 WP 0.55 a.i. kg/ha. Sprays were applied at 345 kPa (50 psi) using a carbon dioxide back pack sprayer on August 18, September 2, September 16, and September 30. Twenty five leaves per plot were collected on October 6 and rated for percent infection.

Table 1. Percent of powdery mildew infected strawberry leaves per treatment

Treatment	Rates a.i. kg/ha	Percent infection means
Benlate	0.55	92.5
Microfine sulfur	4.14	87.2
Easout	0.55	88.0
Untreated		87.3

(DMR .05) No significant differences between treatments

RESULTS AND DISCUSSIONS: As the spores of powdery mildew of strawberries, Sphaerotheca macularis (Wallr. ex Fr.) Jacz. f.sp. fragariae are easily spread by wind and require only high relative humidity to germinate, the dry summer of 1987 was not unfavorable to its spread.

The results and observation from table 1. demonstrated no significant differences between treated and untreated plots. All three treatments, Benlate, Sulfur and Easout had no apparent effect on suppression of powdery mildew once established.

However, infection of plants after the fruit has been harvested reportedly has a negligeable effect on yield the following year and controlling foliar infections with fungicides reportedly has not significantly increased yields even in highly susceptible cultivars (Mass, 1984).

Therefore, if the use of fungicides to control powdery mildew after harvest has no effect, Mass (1984) suggested that fungicides applied in the early flowering period might protect flowers, fruits and foliage.

Strawberry cultivars differ in their resistance to powdery mildew and where powdery mildew is a problem, a resistant cultivar should be used.

REFERENCES: Mass, J.L. 1984. Compendium of strawberry diseases. The American Phythopathological Society. St.-Paul, Minnesota.

EVALUATION OF FUNGICIDES FOR CONTROL OF BOTTOM ROT ON BRUSSELS SPROUT

K.V. Lynch and S.J. LeBlanc

***Abstract**: Three fungicide programs were evaluated for bottom rot suppression on Jade Cross Brussels sprout. All three showed no significant suppression of the disease.*

ÉVALUATION DE FONGICIDES POUR LA RÉPRESSION DE LA POURRITURE BASALE DES CHOUX DE BRUXELLES

***Résumé** : L'efficacité de trois programmes d'application de fongicides pour l'élimination de la pourriture basale sur les plants de choux de Bruxelles de type "Jade Cross" a été évaluée. Aucun des trois fongicides mis à l'essai n'a eu de résultats significatifs pour l'élimination de cette maladie.*

INTRODUCTION: After examining the bottom rot disease responsible for the economic loss encountered at harvest on Brussels sprout, it was determined that as the leaf tissues begin to senesce in the fall, they become susceptible to fungal infections. These infections develop into a soft rot when bacteria colonizes the damaged tissues. Isolations from bottom rot were taken and Alternaria alternata was found to be most prevalent. The disease is more prevalent after a wet season. This work is a preliminary evaluation of three fungicide programs.

MATERIALS AND METHODS: A commercial Brussels sprout field was planted with Jade Cross seedling transplants on June 8, 1987. The experiment was setup and analysed as a four replicate randomized complete block design. Fungicides and rates were: Benlate 50 WP (Benomyl) 0.55 a.i. kg/ha, Rovral 50 WP (iprodione) 1.0 a.i. kg/ha and Dithane M45 80 WP (Mancozeb) 2.72 a.i. kg/ha. Sprays were applied at 345 kPa (50 psi) using a carbon dioxide back pack sprayer on September 17, September 24, October 2, October 9, and October 16. The infected sprout buds were counted on the 15 plants in the plots to determine the percent infection in each plot.

Table 1. Percent of infected sprout buds per treatment

Treatment	Rates a.i. kg/ha	Percent infection means
Benlate	0.55	3.1
Rovral	1.00	3.3
Dithane M45	2.72	4.3
Untreated		2.8

(DMR .05) No significant differences between treatments.

RESULTS AND DISCUSSIONS: Following the dry summer of 1987, the levels of bottom rot infections were too low to evaluate the effectiveness between Benlate, Rovral and Dithane treatments. The results and observations demonstrated that the treatments sprayed did not cover the sprout buds sufficiently to provide any control as the untreated plot had the lowest rate of infection.

As the sprout buds are protected by large leaves that intercept the spray materials, it would be recommended to increase the tank pressure and add an adjuvant to the tank mix ensuring a better coverage and wetting of the sprout buds. However, Jade Cross perhaps due to it's compact growth habit and uneven maturity seems particularly susceptible to this problem and growers should be using other varieties which are less susceptible.

FUNGICIDE CONTROL OF SEPTORIA LEAF AND GLUME BLOTCH IN MAX SPRING WHEAT

K.V. Lynch and D.F. Walker

***Abstract**: Suppression of Septoria leaf and glume blotch was related to both type of fungicide and the growth stage of the crop at the time of application. Fungicides applied at growth stage 31 gave significantly less control then applications at G.S. 39 or 57. Split applications of Tilt or tank mixes of other fungicides with Tilt were not significantly better than a single application of Tilt at G.S. 39 or 57. The best economic return was achieved with a split application of Bravo, however this fungicide is not yet registered on spring wheat.*

LUTTE CONTRE LA SEPTORIOSE ET LES TACHES DE GLUME SUR LE BLÉ DE PRINTEMPS MAX AU MOYEN DE FONGICIDES

***Résumé** : L'élimination de la septoriose et des taches de glume a été fonction des deux types de fongicides utilisés et du stade de croissance de la récolte au moment de l'application. Les applications au stade de croissance 31 ont donné des résultats nettement inférieurs aux applications aux stades de croissance 39 et 57. Des applications distinctes de Tilt ou de mélange d'autres fongicides avec du Tilt n'ont pas donné de meilleurs résultats qu'une simple application de Tilt au stade de croissance 39 ou 57. Le meilleur rapport rendement/coûts a été obtenu au moyen d'une application distincte de Bravo. Cependant, ce fongicide n'est toujours pas homologué pour le blé de printemps.*

MATERIALS AND METHODS: Max spring wheat was planted on April 28 in plots measuring 2 m x 8.5 m arranged in a four replicate randomized complete block design. Fungicides and rates were: Bravo 720 g a.i./ha, Dithane M45 (Mancozeb) 450 g a.i./ha, Folicure 125 g a.i./ha, Tilt 250 g a.i./ha. Sprays were applied on June 8 (GS 31), June 23 (GS 37), and July 6 (GS 59), and 25 penultimate leaves per plot (100 per treatment) were collected on July 23 (GS 80) and rated for disease. Plots were harvested on August 21 and yield and 1000 kernel weight determined.

Table 1. Fungicide control of Septoria leaf and glume blotch in Max spring wheat.

Treatment	% Disease 2nd leaf	% Glume Blotch	Yield kg/ha	1000 Kernal Wt. gram
Untreated	63.6 a	18.4 a	3906 cd	40.0 b
Tilt(31) + Mancozeb(31)	60.7 ab	14.1 bc	4116 abcd	39.5 b
Tilt(31) + Bravo(31)	56.6 bc	10.8 def	3970 bcd	39.8 b
Tilt(31)	53.6 c	13.4 bc	4084 abcd	40.1 b
Folicure(31)	52.3 c	12.9 cd	4071 abcd	41.5 ab
Mancozeb(31) + Mancozeb(59)	41.5 d	15.5 b	3799 d	39.6 b
Tilt(31) + Tilt/ Mancozeb(59)	34.9 e	8.1 gh	4244 abc	40.4 ab
Tilt(31)+Tilt/Bravo(59)	33.2 e	6.9 ghi	4044 abcd	41.7 ab
Tilt(31) + Tilt(59)	29.9 ef	6.8 ghi	4333 ab	41.3 ab
Tilt(37) + Mancozeb(37)	27.2 fg	13.1 cd	4203 abc	39.9 b
Tilt(59) + Bravo(59)	27.1 fgh	8.7 fg	4042 abcd	40.8 ab
Folicure(37)	26.8 fghi	12.7 cd	4332 ab	40.6 ab
Folicure(59)	25.6 fghij	7.0 ghi	4202 abc	40.9 ab
Tilt(59)	24.6 fghijk	6.0 hi	4200 abc	40.8 ab
Tilt(37) + Tilt(59)	23.5 ghijk	8.0 ghi	4256 abc	40.7 ab
Tilt(59) + Mancozeb(59)	20.9 ghijk	11.0 de	4084 abcd	41.6 ab
Tilt(37) + Bravo(37)	20.7 hijk	12.9 cd	4299 ab	40.4 ab
Tilt/Man.(37)+ Tilt/Man.(59)	20.5 ijk	7.1 ghi	4243 abc	40.5 ab
Bravo(37) + Bravo(59)	20.2 jkl	9.0 efg	4363 a	42.7 a
Tilt/Br.(31)+Tilt/Br(59)	18.7 kl	5.8 hi	4330 ab	40.1 b
Tilt(31) + Tilt/Br./Ben.(59)	18.3 kl	5.6 i	4204 abc	42.0 ab
Tilt(39)	14.2 l	12.0 cd	4277 abc	40.8 ab

DMR .05

Man. = Mancozeb
Br. = Bravo
Ben. = Benlate

RESULTS AND DISCUSSION: Development of Septoria leaf and glume blotch on Max wheat for 1987 has already been described (Lynch and Rankin 1987). Disease suppression by fungicides was related to both the type of fungicide and growth stage of the grain at time of application. No fungicides applied at only growth stage 31 significantly increased yield and disease suppression on the second leaf and glumes was minimal. Fungicides applied at growth stage 39 gave good disease suppression on the second leaf and increased yields by approximately 370 kg/ha over the untreated plots. Disease suppression on the glumes was poor (avg. 12.6%) and comparible to levels for growth stage 31 applications (12.8%).

Treatments which involved a split application at growth stages 31 and 57 or 39 and 57 did not suppress disease better than a single application treatment at either G.S. 39 or 57. This can be seen from Table 1 that for the fungicide Tilt most of the disease suppression and resultant yield increase was achieved by a single application at G.S. 39 or 57. Addition of Bravo or Mancozeb to the Tilt application did not improve performance. Treatments at G.S. 57 gave better disease suppression on the glumes than the G.S. 39 applications but this was not necessarily correlated to higher yields.

CONCLUSIONS: All treatments involving two applications of Tilt were economically unjustifiable as the value of the increased yield was less than the cost of the treatment (based on a return of $200 per 1000 kg, current cost fungicide and $10 per hectare application cost). The single Tilt application at G.S. 39 returned $20 per hectare but the greatest return would be with the Bravo 39 + Bravo 57 treatment ($36/ha). These results are similar to those in 1986 with Max wheat (Lynch and Walker, 1986). Bravo is not, however, presently registered for disease control on wheat.

REFERENCES: Lynch, K.V. and Rankin, L. 1987. Max Wheat Disease Survey. Adapt. Res. Report 1987, Plant Industry Branch, New Brunswick Department of Agriculture.

Lynch, K.V. and Walker, D.F., 1986. Evaluation of Fungicides for Control of Foliar Diseases of Spring Wheat. Adapt. Res. Report 1986. Plant Industry Branch, New Brunswick Department of Agriculture.

CONTROL OF DOWNY MILDEW IN LETTUCE WITH RIDOMIL Mz

K.V. Lynch and L. Rankin

***ABSTRACT**: Trials were established in two commercial lettuce fields for the control of late season downy mildew with Ridomil Mz 72 W.P. (2.5 kg/ha). Sprays were applied on August 19, 29, September 8 and 15 and rating was carried out on September 22 at which time the disease severity was high in both fields. Ridomil treatment reduced the severity of disease symptoms by 50% in field one and 60% in field two.*

LUTTE CONTRE LE MILDIOU DE LA LAITUE À L'AIDE DE RIDOMIL Mz

***Résumé** : Le Ridomil Mz 72 W.P. (2,5 kg/ha) a été mis à l'essai dans deux champs commerciaux de laitue afin d'établir sa capacité à lutter contre le mildiou tardif. Des pulvérisations ont été effectuées le 19 août, le 29 août, le 8 septembre et le 15 septembre et l'évaluation des résultats a été effectuée le 22 septembre, moment auquel la gravité de la maladie était élevée dans les deux champs. Le traitement au ridomil a réduit la gravité des symptômes de la maladie de 50 % dans le premier champ et de 60 % dans le deuxième.*

INTRODUCTION: Downy mildew caused by the fungus Bremia lactuca is the most serious disease in the late season crops of field grown lettuce in New Brunswick. In 1986, downy mildew caused 23.0% and 12.5% yield loss in the late August and early September romaine crops. It also caused 4% yield loss in the early October head lettuce crop. In 1987, downy mildew caused 1.6% yield loss in the late July romaine crop. In head lettuce it caused 2.1% and 52.5% yield loss in the mid-August and early September crops respectively.

At present only the fungicides Zineb and Maneb are registered for downy mildew control on lettuce in N.B.

This study was initiated to evaluate the efficacy of Ridomil Mz as an alternative control for downy mildew in lettuce and also to provide further residue data for crop registration.

MATERIALS AND METHODS: This fungicide evaluation was carried out at two locations in Westmorland Co., New Brunswick. Experimental design, similar at both locations, was an unpaired t-test of four treated and four untreated replicates, each replicate consisting of one 9 m row (approximately 30 plants).

The lettuce at both locations was direct seeded on July 5 and was at the 6-10 leaf stage on the date of the 1st spray August 19. On that date, downy mildew was present on the lettuce at location 1 but not at location 2.

Spraying at both locations was done with a CO_2 backpack sprayer at 550 kPa (80psi) with a single D6 cone nozzel attached to the drop pipe. Ridomil Mz 72 WP was applied at 2.5 kg/ha on August 19, August 29, September 8, and September 15. On September 22 the trial was rated for downy mildew and the lettuce was sampled for residue analysis.

Disease rating was done by visually estimating the severity of downy mildew on 20 randomly selected heads in each treated and untreated replicate and assigning a value from 1 (no lesions) to 6 (severe tissue necrosis). Values of 3 or above indicate the severity of the disease had rendered the lettuce unmarketable. After rating, residue analysis samples were taken and supplied to Brady Code, Maritime Technical Representative. Ciba-Geigy Canada Ltd. for analysis.

RESULTS AND DISCUSSION: Two seasons of lettuce disease survey indicates that growers can expect a late season problem with downy mildew. If the lettuce growing season is to be extended, then consistent production must be guaranteed by effective disease management. Ridomil Mz appears to give good disease control with reductions of 50% and 60% in the severity of disease symptoms at location 1 and 2 respectively. At location 1 the disease suppression was good even though downy mildew was established in the field prior to first application. Hopefully, results from the residue analysis will be favorable allowing more work to proceed towards registration of this product.

Table 1: Supression of Downy Mildew by Ridomil Mz

Location	Treatment	# Replicates	Average
1	Check	4	3.72
1	Ridomil Mz	4	1.85*
2	Check	4	3.38
2	Ridomil Mz	4	1.35*

*Significantly different from check at 0.05 level.

LETTUCE DISEASE SURVEY IN NEW BRUNSWICK, 1986-1987

Lynda Rankin

Abstract: Field lettuce (Lactuca sativa L.) is produced on approximately 12 ha in the southeast of New Brunswick. Harvest is staggered from July to October through sequential transplanting and direct seeding. Only minimal efforts are made to manage disease and insect problems. The most important diseases in 1986 and 1987 were grey mold (Botrytis cinerea Pers.), bottom rot (Rhizoctonia solani Kuhn), drop or white mould (Sclerotinia sclerotiorum (lib) de By.), tip burn (a physiological disorder), aster yellows (a mycoplasma vectored by the Macrosteles fascifrons Stal species complex) and downy mildew (Bremia laxtucae Regel). Economic loss from most of these diseases did not warrant control. Aster yellows vector control is already used. Gray-mold control is recommended for early season transplant crops. Downy mildew control is recommended for late season crops with spraying based on monitoring for the presence of the pathogen.

ÉTUDE DES MALADIES DE LA LAITUE AU NOUVEAU-BRUNSWICK EN 1986-1987

Résumé : On cultive environ 12 ha de laitue des champs (Lactuca sativa L.) dans le sud-est du Nouveau-Brunswick. La récolte se prolonge de juillet à octobre grâce à une transplantation continue et au semis direct des graines. Des efforts minimes ont été déployés afin de régler les problèmes de maladies et d'insectes. Les maladies les plus importantes en 1986 et 1987 ont été la moisissure grise (Botrytis cinerea Pers.), la pourriture basale (Rhizoctonia solani Kuhn), l'affaissement sclérotique (Sclerotinia sclerotiorum (lib) de By.), la brûlure de la pointe (un problème physiologique), la jaunisse (un mycoplasme transmis par l'ensemble des espèces Macrosteles fascifrons Stal) et le mildiou (Bremia laxtucae Regal). Les pertes économiques causées par la plupart de ces maladies n'ont pas justifié la mise en place de moyens de contrôle. On mène déjà une lutte efficace contre le vecteur de la jaunisse. La prise de mesures contre la moisissure grise est recommandée pour les plants de repiquage des récoltes hâtives. Pour les récoltes plus tardives, on recommande la répression du mildiou au moyen d'un arrosage, le tout en fonction de la présence du pathogène.

Footnote: Letture Disease Survey in New Brunswick 1986. Published in Canadian Plant Disease Survey 67:2.

INTRODUCTION: Filed lettuce is produced on approximately 12 ha in the southeast of New Brunswick. Both heading and romaine lettuce are grown in the area. Through the use of staggered cropping, the harvest is continuous from July to October. At present only minimal efforts are made to manage disease problems in the crop.

A disease survey was conducted throughout the summer of 1986 and again in 1987 to determine both the type of diseases present and their effect on marketable yield. In 1986 twenty-nine fields were surveyed and in 1987 seventeen fields were surveyed. The purpose of these surveys was to direct future production recommendations and predict the level of inherent loss associated with lettuce production in New Brunswick.

METHODS: The survey was conducted by inspecting the majority of commercial lettuce fields in the designated areas when they were 50 - 70% harvested. In each field three rows were randomly selected and within each row the number of healthy plants was determined. All harvested heads (evident by the remaining stem) were presumed healthy. Diseased heads, usually left standing in the row, but also those cut and discarded between the rows, were diagnosed on the basis of symptoms and when evident, by the signs of the pathogen. At the time of rating the average number of plants per row was determined, as well as an estimate of field size. This information was combined with the data from each of the three rows rated to obtain an estimate of the total number of plants exhibiting the symptoms of each disease found in the field. For each sampling date these total numbers of each disease for each field were than added to determine an average percent disease (fig. 1, 2, 5 & 6). For the season disease totals (fig. 3, 4, 7 & 8) estimates of the numbers of diseased plants from each field as well as total plant numbers were summed for the entire season before being converted to percentage thereby accounting for variable production levels on the different sampling dates.

FIGURE 1

ICEBERG LETTUCE
PERCENT DISEASE BY SURVEY DATE

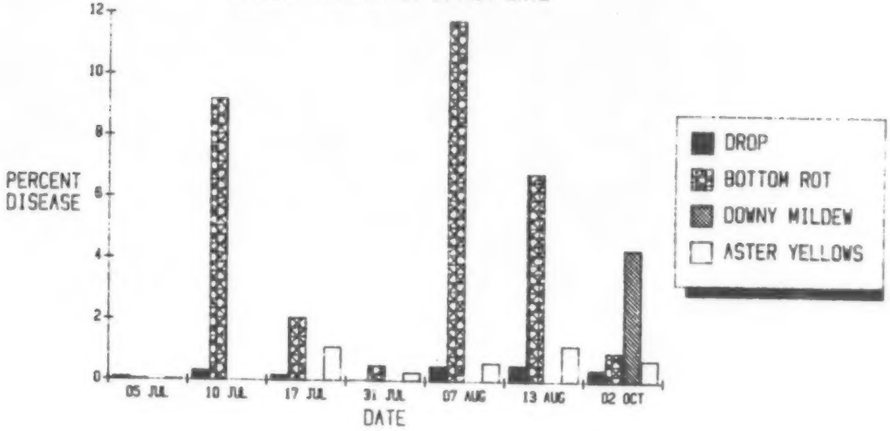


FIGURE 2

ROMAINE LETTUCE
PERCENT DISEASE BY SURVEY DATE

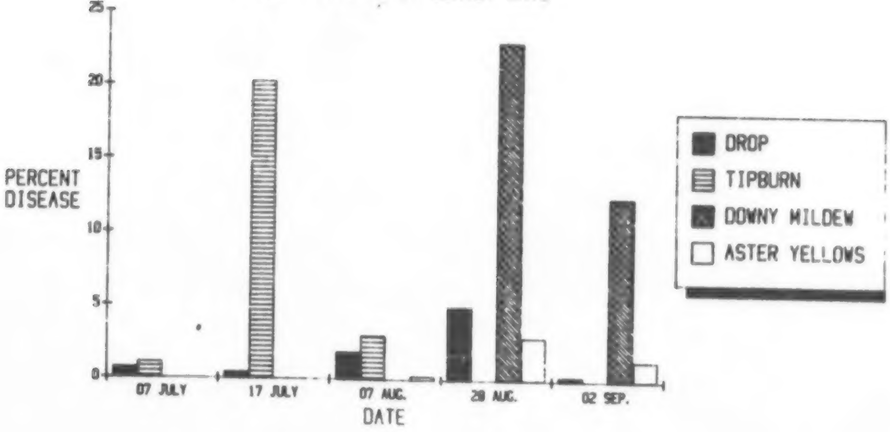


FIGURE 3

ICEBERG LETTUCE
DISEASE TYPE AS A PERCENT OF TOTAL DISEASE

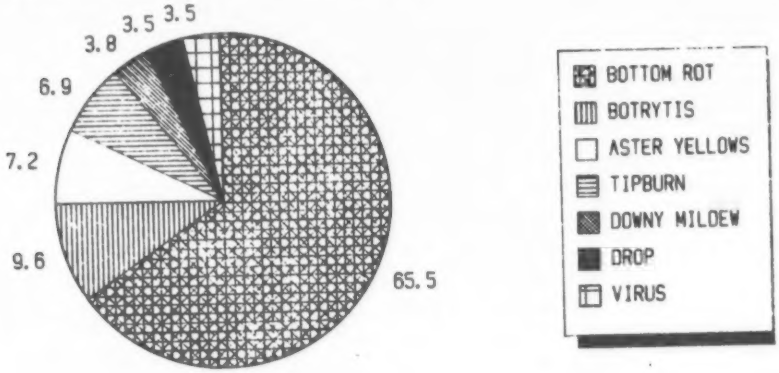


FIGURE 4

ROMAINE LETTUCE
DISEASE TYPE AS A PERCENT OF TOTAL DISEASE

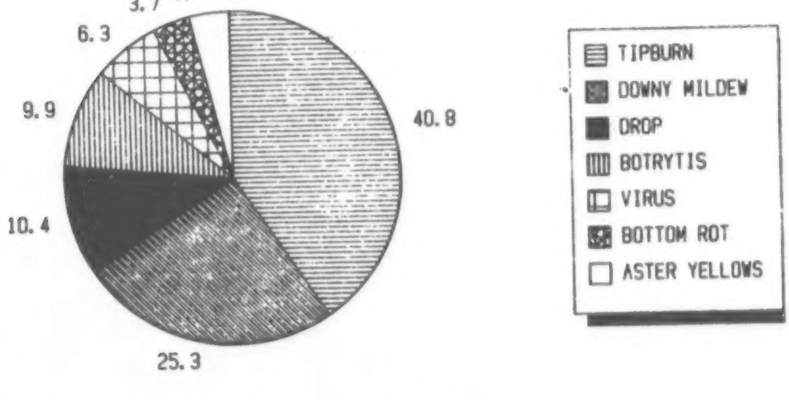


FIGURE 5

ICEBERG LETTUCE
PERCENT DISEASE BY SURVEY DATE

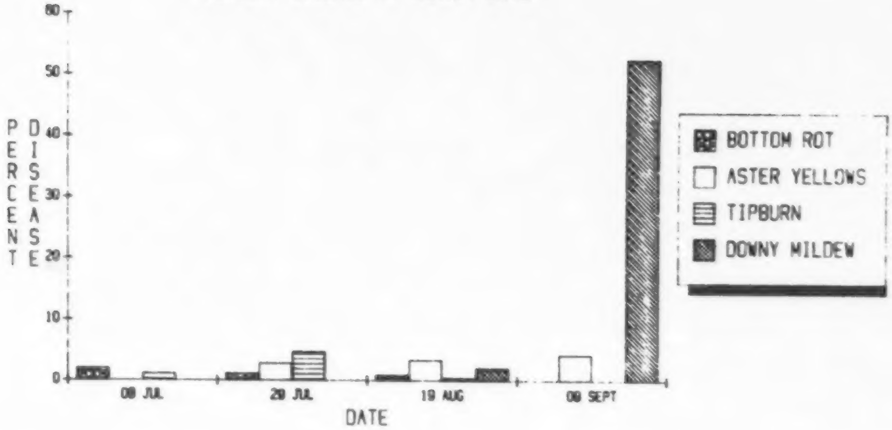


FIGURE 6

ROMAINE LETTUCE
PERCENT DISEASE BY SURVEY DATE

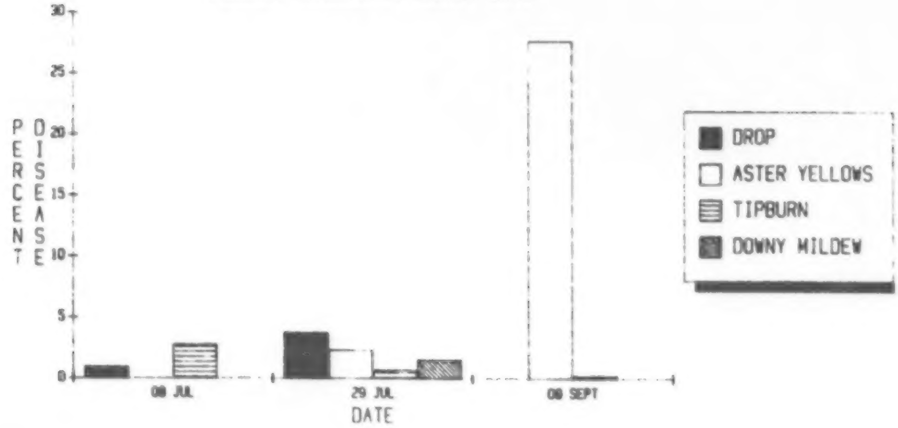


FIGURE 7

ICEBERG LETTUCE
DISEASE TYPE AS A PERCENT OF TOTAL DISEASE

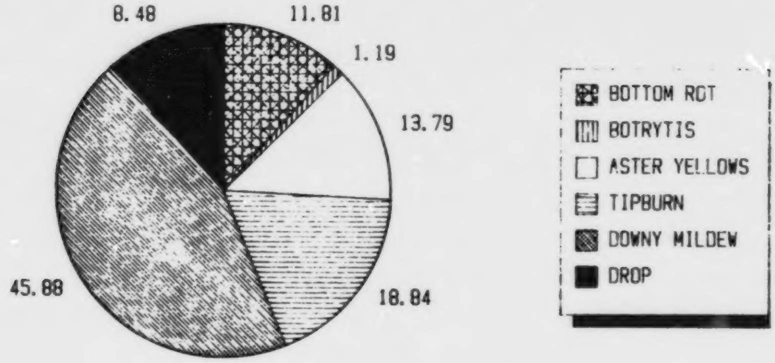
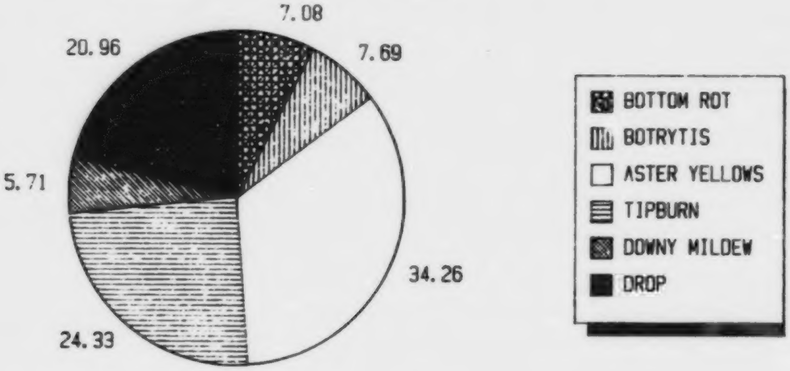


FIGURE 8

ROMAINE LETTUCE
DISEASE TYPE AS A PERCENT OF TOTAL DISEASE



RESULTS AND DISCUSSION: *Botrytis cinerea* was found attacking dead and damaged lettuce tissue at all stages of growth. The greatest loss occurred on the early season transplants, many of which were frost damaged during hardening off or following transplanting into field. For two fields rated in 1986 for early season transplant infection of this type, it was found that this damage resulted in 2 and 11% loss. Low levels of *Botrytis* were found in fields of mature romaine and head lettuce throughout the growing season often associated with damage such as tipburn.

Figures 1 and 2 represent data from twenty nine lettuce fields surveyed in 1986. Figures 5 and 6 represent data from the seventeen fields surveyed in 1987. Both sets of figures summarize the variation in incidence of the four most prevalent diseases observed on mature head and romaine lettuce respectively.

In 1986 Bottom rot (*Rhizoctonia solani*) was the most destructure disease on head lettuce and resulted in significant losses. The greatest incidence was on August 7. At that time yield losses of 9.7% occured on surveyed fields. This disease also resulted in some fields being abandoned prior to complete harvest. These abandoned fields were not surveyed. In 1987 the highest incidence of bottom rot in head lettuce occured on July 8, and resulted in only 2% yield loss. Bottom rot in romaine lettuce in both 1986 and 1987 was minimal, with yield losses of less than 1% per harvest date.

Lettuce drop or white mold can be caused by either *Sclerotinia sclerotiorum* or *Sclerotinia minor*. In 1986 drop caused by *Sclerotinia minor* was only found in one field while in 1987 all cases of drop found were caused by *Scelerotinia sclerotiorum*. In head lettuce yield losses due to drop were below 1% in 1986 and below 2% in 1987. In Romaine yield losses due to drop peaked at 5% on August 28, 1986 and 3.8% on July 29, 1987.

Yield losses due to tipburn reached 20.2% on Romaine lettuce in 1986 but were low in 1987 with only 2.8% yield loss. Tipburn losses were low in head lettuce in 1986 but caused yield losses of up to 4.8% in 1987.

The lettuce growers periodically spray the crop for control of the aster yellows vector *Macrosteles fascifrons*. Aster yellows was found in the survey area in low levels in 1986, and ranging up to 27.7% of the lettuce affected in two fields of Romaine in 1987. The yield loss due to aster yellows in head lettuce were low.

The data indicates that downy mildew was the most prevalent disease in late season head lettuce in both 1986 and 1987 and late season romaine in 1986. In 1987 downy mildew levels peaked on September 9, when 52.5% of head lettuce was infected.

CONCLUSIONS: Losses from *Botrytis cinerea* in the early season transplants and downy mildew (*Bremia lactucae*) in the late season lettuce crop were high during the course of this survey. Therefore it would seem the potential for loss in the future warrants the use of control procedures. Transplants should be sprayed with a protectant fungicide in the greenhouse to prevent the build up of *Botrytis* and its subsequent carry over into the field. Late season lettuce should be inspected regularly for the presence of downy mildew and fungicides should be applied when it is first noted.

Figures 3,4,7 and 8 show each disease as a percent of total disease occuring over the entire season in head and romaine lettuce respectively. In 1986 the most serious disease of Romaine lettuce was tipburn in 1987 it ranked second. Highest yield losses occured in July in both years as summer temperatures approached their maximum. Possibly the high incidence of tipburn in 1986 resulted from overmaturity of the lettuce prior to harvest. Timely harvesting of the lettuce, prior to maturity, during this time period would reduce losses.

At present their are no fungicides registered for the control of lettuce drop (*Sclerotinia* sp.) however some are being examined for a minor crop registration. Unless the incidence of drop increases in the crop, chemical control is not warranted. Sporatically individual fields may have higher losses but there is presently no way to predict disease severity. Therefore yield lost due to drop should be considered one of the inherent losses associated with lettuce production. Other losses of this type to be considered include bolting, deformity of plant, animal damage, and insect damage.

In 1986 bottom rot (*Rhizoctonia solani*) was the most serious disease in head lettuce however in 1987 yield loss was not as high. The majority of the loss occured in mid-season crops and often resulted in partial harvesting or plow down of fields. As plowed down fields could not be surveyed, actual losses due to this disease exceed what is presented in the results. No fungicides are registered for the control of bottom rot, losses due to this disease must be considered among the inherent losses of lettuce production. The severity of these losses in the mid-season head lettuce crop indicate the need for work towards a minor crop registration of a fungicide to control this disease.

MAX WHEAT DISEASE SURVEY

K.V. Lynch and L. Rankin

***Abstract**: Eighteen commercial Max wheat fields were monitored from June 11 to August 6 for disease prevalence. Significant build up of Septoria leaf and glume blotch did not occur until after heading, which agrees with observations of past seasons. Fusarium head blight was severe with up to 75 percent of heads affected in Carleton Co. and 25 percent in Victoria-Madawaska Co. Visually assessed prevalence of Fusarium head blight in the field was not strongly correlated to either actual percent infecton or vomitoxin level of harvested grain. Actual infection varied from 10.5 to 100 percent of kernals and vomitoxin from 0.2 to 6.2 ppm among different farms, however, the Victoria Madawaska region was significantly higher than Carleton Co. More information is needed on control of this disease if milling wheat production is to expand to its full potential in New Brunswick.*

ENQUÊTE SUR LES MALADIES DU BLÉ MAX

***Résumé** : Dix-huit champs commerciaux de blé Max ont fait l'objet d'une surveillance du 11 juin au 6 août afin d'établir la prévalence des maladies. La septoriose et les taches de glume ne se sont pas manifestées avant l'épiaison d'épis, ce qui confirme les observations des saisons précédentes. La prévalence de la brûlure de l'épi était grave. En effet, 75 % des épis étaient touchés par cette maladie dans le comté de Carleton et 25 % dans le comté de Victoria-Madawaska. La prévalence de la brûlure de l'épi n'était pas, selon une estimation visuelle, étroitement reliée au pourcentage réel d'infection ni au niveau d'infestation par la vomitoxine du grain récolté. La prévalence réelle de l'infection variait de 10,5 % à 100 % des grains et on retrouvait de 0,2 à 6,2 ppm de vomitoxine selon les fermes. Cependant, la région de Victoria Madawaska avait un taux de prévalence significativement plus élevé que le comté de Carleton. Plus de renseignements sont nécessaires sur la répression de cette maladie si l'on désire que la production de blé de mouture réalise son plein potentiel au Nouveau-Brunswick.*

INTRODUCTION: Max wheat, a German spring wheat cultivar, has recently been introduced to New Brunswick growers. This milling wheat has a high yield potential and is well suited to our local climatic conditions.

Quality requirements for milling wheat are higher than those for the feed grains commonly grown here. These include high hectolitre weight (bushel weight), 13.5% protein, 14.5% or less moisture and clean bright kernals. To meet these requirements, good disease management in the crop is crucial.

Max is presently resistant to powdery mildew. The main source of yield reduction due to disease is Septoria leaf and glume blotch caused by S. nodorum. However, in those sporatic seasons when Fusarium head blight (Fusarium spp.) is epidemic yield reductions can be extensive. In addition, this disease which produces "tombstone" kernals, can reduce grade. Mycotoxin formed in the grain can render it unfit for milling purposes.

This study was initiated to follow the progress of disease in commercial Max production. The purpose was to produce background information to direct disease management procedures in the future.

MATERIALS AND METHODS: Max wheat was grown this year by 33 grain producers located in three areas of the province: Carleton Co., Victoria and Madawaska Co. and Northumberland Co. The hectarage breakdown was as follows: Carleton Co. 21 growers, 281 hectares; Victoria & Madawaska Co., 6 growers, 210 hectares; and Northumberland Co., 6 growers 42 hectares. Due to time constraints only 10 of these growers were chosen to be monitored throughout the season.

These 10 farms, approximately 18 fields were monitored on a weekly basis commencing June 11 and ending August 6, the period most likely for disease development. Monitoring consisted of walking through the fields each week and visually estimating disease severity. From this estimate a percent disease value was assigned to each field based on the Horsefall-Barrett disease rating scale. On the final survey date in addition to the visual rating, all fields were sampled by taking 25 heads per field.

These heads were returned to the lab and individually rated for both Septoria glume blotch and Fusarium head blight.

When the fields were harvested, samples of cleaned grain (16 kg) from each farm included in the survey were collected at the grain terminals . From each of these samples 2 subsamples were taken, one of 10 kg and one of 50 g. The 10 kg subsamples from each farm were sent to the Atlantic Province Pesticide Residue Analysis Lab for vomitoxin analysis. This analysis was conducted according to the Health and Welfare Canada Method LPEC-138. Recovery rate on control sample was 94%. The second set of subsamples (50 g) were sent to Dr. Richard A. Martin, Research Scientist, Agriculture Canada, Charlottetown, for percent seed infection analysis. The seed was surface sterilized and plated on PCNB media.

RESULTS AND DISCUSSION:

Carleton Co.

Septoria did not develop until June 26 in Carleton Co. at which time it was present at 1-3% on the 4th leaf counting down from the top. By July 10, the fourth leaf had senesced and Septoria ranged from 1-6% on the third leaf. The third leaf had senesced by July 22 and Septoria ranged from 3-12% on the penultimate leaf. By August 6, Septoria had increased to 12-50% on the penultimate leaf and was present in trace amounts on the flag leaf. On this date Septoria glume blotch was 18% on the head.

Fusarium Head Blight was present on 50% of the heads in July 22 and by August 6 it had progressed to between 50-75% of the heads.

In samples collected from the field on this date 12.4% of the kernels appeared infected with Fusarium Head Blight.

Victoria and Madawaska Co:

Septoria showed up later in Victoria-Madawaska Co. than Carleton Co. possibly due to the difference in climatic conditions and wheat growth stage between the two areas. On July 2, Septoria was present at 1-6% on the 4th leaf counting down from the top. By July 9 it had progressed to between 6-25% of leaf area infected on the 4th leaf, 1-3% on 3rd leaf and trace amounts on both the penultimate and flag leaves. By July 28 both the 4th leaf and 3rd leaf had senesced and Septoria was present on the penultimate leaf at between 6-50% with trace amounts on the flag leaf. By August 6, Septoria had increased to 25-75% on the penultimate leaf and was still present at trace amounts on the flag leaf. On this date, Septoria glume blotch was 4.8% on the head. Fusarium head blight was present on 6-25% of the heads on July 28. By August 6 it had progressed to 12-25% of the heads. In samples collected from the fields on this date, 7.8% of the kernals appeared infected with Fusarium head blight.

Actual infection of the seed by Fusarium spp. as determined by plating on PCNB media revealed that infection rates varied from 10.5 to 100% (Table 1). Four species of Fusarium were isolated but only two were commonly present (Table 2).

Due to the inherent variables existing between commercial fields, surveys do not provide an adequate basis for detailed description of their differences. However, with observation over several seasons trends emerge which allow recommendations to be made with some degree of assurance.

From graphs 1 and 2 it is evident that significant build up of Septoria did not occur until after growth stage 55. This agrees with observations of past years and would indicate that fungicides for Septoria control will be most effective if applied during and after heading. Septoria glume blotch was significantly greater in Carleton Co. than Victoria-Madawaska Co.

Max wheat is considered intermediate in its susceptibility to Fusarium head blight. At harvest head infection rates and vomitoxin levels were high (Table 1). Although this disease can be found every year in New Brunswick it only occasionally becomes a major limitation to production. Perhaps one of the most interesting aspects of the survey was the complete lack of correlation between visual assessment of disease and actual infection as determined by plating. In Victoria-Madawaska Co., 6-25% of the heads and 7.8% of the kernals appeared infected with Fusarium while the actual infection rate of the seed was 68%. In Carleton Co. 50-75% of the heads and 12.4% of the kernals appeared infected. The actual infection rate of cleaned seed was only 34.5%, about one half of the Victoria Madawaska Co. infection rate. Vomitoxin content was correlated with actual infection rate averaging only 0.5 ppm in Carleton Co. but 4.8 ppm in Victoria-Madawaska Co. Possible explanations for this inconsistency are several but the following points should be considered. Actual infection rates and vomitoxin levels were determined from cleaned seed whereas visual ratings were made in the field and from hand harvested samples. Early severe infections can lead to floret sterility and light kernals which are readily removed during harvesting and cleaning operations. However late infections are not readily visible to the unaided eye in the field and kernel weight will be such that they are retained during cleaning. Regardless of the reason, it is clear that visual inspections particularly in the field are a poor indication of vomitoxin content. The maximum allowable level of vomitoxin for soft wheat flour is 1.4 ppm. With this standard grain from Carleton Co. was acceptable for this use but the Victoria-Madawaska Co. grain was significantly above the allowable limit.

Four different Fusarium species were isolated from infected grain. Only two, F. graminearum and F. avenaceum were prevalent. F. poae, which is often found associated with head blight in the Maritimes was only isolated from one sample. Relative frequencies of F. graminearum and F. poae may depend on local climatic conditions and are therefore variable from season to season (Personal communication - Dr. Richard A. Martin).

CONCLUSIONS: Septoria diseases are a problem with which N.B. grain growers are familar and can deal with. Selection of fungicide, fine adjusting of spray timing and disease monitoring are areas that can always be improved to maximize profit. Fusarium head blight may be a major limitation for milling wheat production expanding to its full potential. Resistance is not available in currently recommended spring wheat varieties and fungicidal control has been inconsistent. Growers will not be willing to expand production rapidly if they cannot be reasonably assured of a marketable product. Control of *Fusarium* head blight will not come easily or quickly and more work is needed on; breeding for resistance, chemical control and epidemiology. Hopefully, this need for basic research will be recognized and funded.

ACKNOWLEDGEMENTS: Special thanks to Dr. Richard A. Martin, CDA Charlottetown for determination of actual percent infection, *Fusarium* species profiles and comments on *Fusarium* epidemiology.

Table. 1: Percent Disease on Max Wheat

LOCATION	Farm #	VISUAL RATING % OF HEAD WITH SEPTORIA GLUME BLOTCH[AB]	VISUAL RATING % KERNALS PER HEAD FUSARIUM HEAD BLIGHT[A]	PERCENT KERNELS INFECTED WITH FUSARIUM[C]	VOMOTOXIN ppm
VICTORIA-MADAWASKA	1	4.3	10.6	10.5	4.5
"	2	4.0	7.5	90.5	6.2
"	3	NA	NA	72.4	4.2
"	4	5.0	5.7	65.7	5.2
"	5	6.1	7.3	100.0	4.1
CARLETON CO.	6	17.0	10.8	43.8	1.2
"	7	15.5	12.3	27.6	0.7
"	8	17.9	13.7	12.4	0.2
"	9	21.3	12.9	54.3	1.1

A - Average of 25 heads

B - rated according to Horsetall-Barett

C - surface sterilized and plated on PCNB media

Table 2. Frequency of Fusarium Species

LOCATION	FARM #	% F.graminearum	% F.aveaceum	% F.poae	% F. sporotrichiodes
Victoria-Madawaska	1	85.7	14.3	0	0
"	2	86.7	13.3	0	0
"	3	72.2	27.8	0	0
"	4	86.7	13.3	0	0
"	5	78.6	21.4	0	0
Carleton Co.	6	93.3	6.7	0	0
"	7	66.7	26.7	0	6.7
"	8	46.2	30.8	23.1	0
"	9	80.0	20.0	0	0

Fig. 1

MAX WHEAT
MAXIMUM DISEASE SEVERITY BY DATE IN
MADAWASKA CO. AND VICTORIA CO.

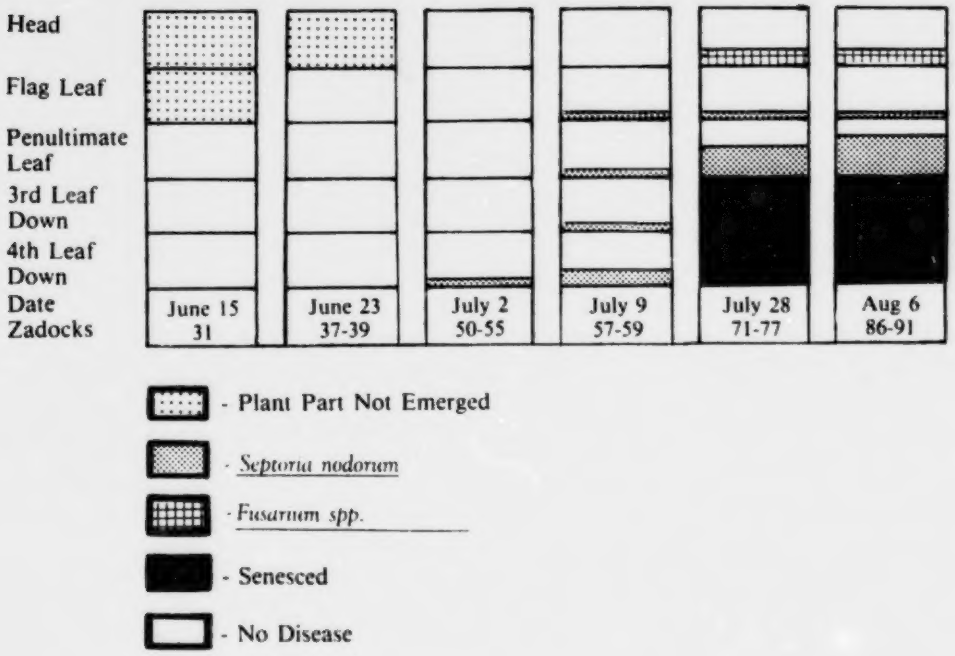
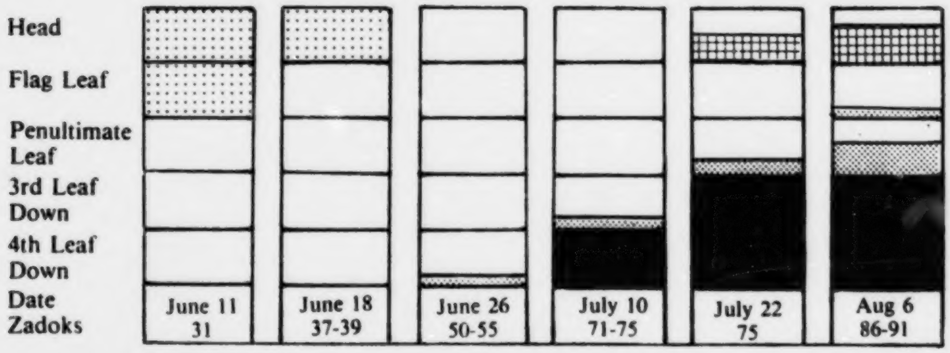


Fig. 2

MAX WHEAT
MAXIMUM DISEASE SEVERITY BY DATE IN
CARLETON CO. 1987



PRELIMINARY OBSERVATIONS ON THE CALCIUM-POTASSIUM EFFECTS ON YIELD OF ALFALFA

R.P. Hinds and P.K. Scott

Abstract: *Alfalfa production is being examined on the Caribou Soil Series with pH 6.1 over a three year period under three levels of calcium applications (4.5 t/ha calcitic limestone; 4.5 t/ha gypsum and 0 t/ha calcium) and three levels of potash at 0 kg/ha potash; 336 kg/ha potash and 672 kg/ha potash. The alfalfa stand was established one year prior to calcium applications.*

While the calcium treatments did not significantly influence yield, the gypsum treatment produced the highest yield of dry matter and protein.

The 336 kg/ha level of potash was the best treatment even though potash levels were not significant.

None of the calcium/potash interactors were significantly different from each other. The 4.5 t/ha gypsum with 672 kg/ha of potash produced the highest yield of dry matter and protein.

Where no limestone or gypsum was applied, the highest dry matter and protein yield was produced at 336 kg/ha potash. The higher level of potash with no limestone or gypsum decreased dry matter and protein yield. This work will continue over the next 2 years.

OBSERVATIONS PRÉLIMINAIRES DES EFFETS DU CALCIUM ET DU POTASSIUM SUR LE RENDEMENT DE LA CULTURE DE LUZERNE

Résumé : *La production de luzerne est actuellement étudiée sur les séries de sol Caribou ayant un pH de 6,1. Ces essais dureront trois ans et les applications de calcium se font à trois niveaux (4,5 t/ha de chaux calcique; 4,5 t/ha de gypse et 0 t/ha de calcium). Il en va de même pour les applications de potasse, soit 0 kg/ha, 336 kg/ha et 672 kg/ha. La luzerne a été semée une année avant les applications de calcium.*

Bien que les traitements au calcium n'aient pas influé de façon significative sur le rendement, le traitement au gypse a permis d'obtenir des rendements supérieurs sur le plan de la matière sèche et des protéines.

Le traitement consistant à appliquer 336 kg de potasse à l'hectare s'est avéré le meilleur même si les niveaux de potasse n'étaient pas significatifs.

Les produits résultant des interactions entre le calcium et la potasse n'étaient pas significativement différents les uns des autres. La parcelle traitée à raison de 4,5 t/ha de gypse et de 672 kg/ha de potasse est celle qui a donné les meilleurs rendements en matières sèches et en protéines.

Aux endroits où on a pas appliqué de chaux ni de gypse, le rendement le plus élevé en matières sèches et en protéines a été obtenu sur les parcelles traitées à raison de 336 kg de potasse à l'hectare. L'application d'un niveau plus élevé de potasse sans chaux ou gypse a réduit le rendement en matières sèches et en protéines. Cette étude se poursuivra au cours des deux prochaines années.

INTRODUCTION: Alfalfa can be made into a highly profitable crop by making a few management changes to the old approach to alfalfa production. These changes can and have resulted in increases in alfalfa acreages across the province. Alfalfa responds dramatically to high levels of fertility and a complete production program.

Critical areas of alfalfa management include soil acidity, sulphur levels and potash fertility.

Alfalfa is very sensitive to soil acidity because microbial fixation of atmospheric nitrogen is inhibited in very acid soils. Under most conditions the best pH for alfalfa production is between 6.5 - 7.5 and yields are reduced when the pH is 6.0 or lower. Soils in N.B. have naturally low pH's ranging from 4.8 - 5.2. The application of lime would mean about 8 - 16 t/ha to raise the pH to about 7.0 for alfalfa production. Not only is the pH requirement for alfalfa high but also in the production of hay (yields of 8-12 t/ha) the alfalfa crop removes from the soil the following nutrients.

N - 302 kg/ha
P - 68 kg/ha
K - 302 kg/ha
Ca - 188 kg/ha
Mg - 36 kg/ha
S - 32 kg/ha
cl - 46 kg/ha
B - 0.1 kg/ha
Cu - 0.1 kg/ha
Fe - 1.3 kg/ha
Mn - 0.7 kg/ha
Zn - 0.7 kg/ha

The calcium and sulphur requirements of the crop are indeed very high. Lime reacts very slowly with soil and during rapid growth readily available sources of calcium and sulphur are necessary. Given a pH of 6.0 - 6.2, all the calcium and sulphur needed by the crop can be readily supplied by gypsum, which is 100 times more soluble than limestone and does not change pH. One tonne of gypsum can supply 180 kg of calcium and 144 kg of sulphur. It must be noted that acid rain produces 9-12 kg/ha of suplhur and so falls short of supplying the 32 kg/ha needed by the crop.

Work done in the U.S.A. (IMC Fert. Inc.), and elsewhere has demonstrated in crops like peanuts, hay and barley where rapid uptake of calcium is needed by the crop, gypsum is a faster supplier than lime. Alfalfa requires high amounts of potash, especially in the fall when root reserves must be built up to "winterize" the crop and provide stored energy for rapid growth. A typical established stand of alfalfa (MacLean 1987) stand in N.B. requires about 300-400 kg/ha of nutriate of potash to replace what was removed by the current year's crop.

Timing of potash application is also important for persistence of the crop. It takes about six weeks to build up adequate root reserves for winter so that adequate potash must be available 6-8 weeks before a killing frost. These basic issues in alfalfa production have led us to believe that gypsum, as a source of calcium and sulphur, would be better than limestone when adequate supplies of potash are applied on stands of alfalfa grown in soils of pH 6.0 and above. A three year study was therefore undertaken to examine these effects on the Caribou Soil series.

METHODS: A split plot design was employed on a one year old stand of alfalfa grown on the Caribou Soil Series in Woodstock. Replication was three.

Main Plots: 4.5 t/ha - calcitic limestone
4.5 t/ha - gypsum
0 t/ha
- Calcitic limestone - 38% calcium
- Gypsum - 20% calcium, 18% sulphur
- pH of main plots - 6.1 - 6.6

*Sub-Plots: - 672 kg/ha - potash
- 336 kg/ha - potash
- 0 kg/ha - potash

*Sub-plot size was 0.13 hectare. Potash was applied 1 week after 2nd cut on Aug. 17, 1987. Maintenance fertilizer rate was 336 kg/ha (spring application) of 5-20-20 blend.

The following measurements were taken:

- soil tests prior to treatment with main plots and after sub-plot treatment.
- 1st cut - June 7
- 2nd cut - Aug. 10
- Standard feed analysis done on 1st and 2nd cut - Dry matter %; Protein %; ADF %, T.D.N. %, Calcium %, P_2O_5 %, Mg %, K %.

RESULTS AND DISCUSSION:

Effect of Calcium Applications

Table 1 shows the response of alfalfa to prior calcium applications. Alfalfa has a high requirement for calcium and sulphur with an 8.0 t/ha crop removing about 188 kg/ha of calcium and about 32 kg/ha of sulphur. Even though the treatments were not significantly different from each other, 4.5 t/ha of gypsum produced the best total yields of dry matter and protein from two cuttings. The fact that gypsum is 100 times more soluble than limestone may be the reason for this apparent difference.

TABLE 1: RESPONSE OF ALFALFA TO PRIOR CALCIUM FERTILIZATION

*Treatments	Soil pH prior to Treatment	Leaf % Calcium 2nd Cut	Tonnes/hectare Total yield-2 cuts	
			Dry matter	Protein
4.5 t/ha calcitic limestone	6.4	2.6	8.0	1.41
4.5 t/ha gypsum	6.2	2.5	8.5	1.44
0 t/ha	6.3	2.6	7,8	1.32

*Calcitic limestone - 30% calcium
Gypsum - 20% calcium; 16% sulphur

Effect of Potash/Calcium Applications

Table 2 and Figure 1 show the effect of three potash treatments at three levels of prior calcium fertilization on yield of alfalfa at the time of the second cutting.

Potash is especially important in the fall when root reserves must be built up to "winterize" the crop and provide stored energy for rapid growth. Established stands in N.B. require 350 - 400 kg/ha. of potash annually and so it was decided to look at calcium/potash effects on yield. As timing is important, potash was applied after the 2nd cut and 6-8 weeks before the first killing frost to allow the crop to build up adequate reserves for winter. Though the yields were not signficant at the 5% level, the 4.5 t/ha of gypsum produced the highest yields of dry matter and protein. The effect of potash was greatest on yield at 336 kg/ha. From this first year's data, gypsum at 4.5 t/ha with 672 kg/ha of potash produced the highest yields of dry matter and protein. In general, all the gypsum/potash treatments yielded better than the other treatments with the exception of the treatment where no limestone was applied with 336 kg/ha of potash. No limestone in combination with 672 kg/ha of potash produced a decreased yield.

TABLE 2 - SUMMARY OF RESULTS

The Effect of Three Potash Treatments at Three Legvels of Prior Calcium Fertilization on Yield of Alfalfa.

	*Mean Yield - 2nd Cut Tonnes/Hectare	
Treatments	Dry Matter	Protein
1. Main Plots		
0 t/ha	1.83	0.31
4.5 t/ha Gypsum	1.98	0.34
4.5 t/ha Calcitic limestone	1.83	0.32
2. Sub-Plots		
0 kg/ha Potash	1.87	0.32
336 kg/ha Potash	1.89	0.33
672 kg/ha Potash	1.87	0.32
3. Calcium X Potash Effect		
0 t/ha x 0 kg/ha Potash	1.72	0.29
0 t/ha x 336 kg/ha Potash	2.00	0.34
0 t/ha x 672 kg/ha Potash	1.76	0.29
4 t/ha Gypsum x 0 kg/ha Potash	1.96	0.34
4.5 t/ha Gypsum x 336 kg/ha Potash	1.91	0.34
4.5 t/ha Gypsum x 672 kg/ha Potash	2.06	0.35
4.5 t/ha Calcitic limestone x 0 kg/ha Potash	1.92	0.34
4.5 t/ha Calcitic limestone x 336 kg/ha Potash	1.77	0.32
4.5 t/ha Calcitic limestone X 672 kg/ha Potash	1.79	0.31

*Not significant at 5% level.

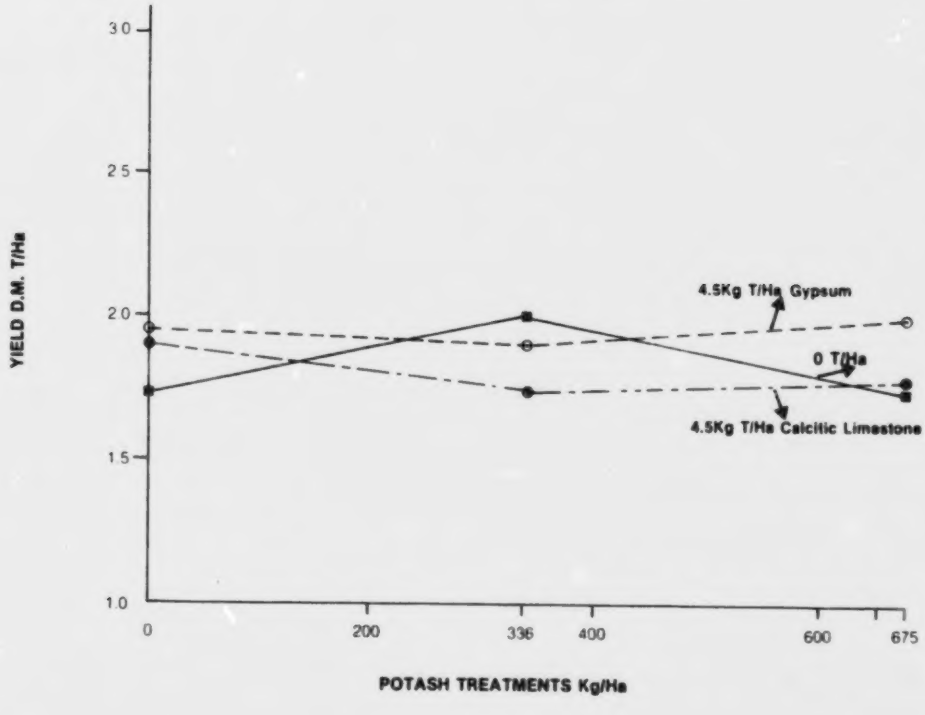
CONCLUSION: Gypsum has had a very positive effect on alfalfa yield of dry matter and protein. From the first year's data, 4.5 t/ha of gypsum with 672 kg/ha of potash was the best treatment.

Where no limestone was applied, the best yields of dry matter and protein were obtained with 336 kg/ha of potash. The higher application of potash (672 kg/ha) where no limestone was applied resulted in decreased yields of dry matter and protein. Observations over the next 2 years will be used to identify any trends.

REFERENCES: 1. IMC Fertilizer Inc. 1986 - Maximum Economic Yield. Circular No. 7.

2. McLean C. 1987 ed. Soils and Crops Newsletter. Vol. 2. No. 1. NBSCIA.

FIGURE 1: Yield of alfalfa at three levels of potash to prior calcium treatments - 2nd cut.



EFFECT OF NITROGEN FERTILIZER RATE AND SPACING ON YIELD OF DESIREE CULTIVAR SEED POTATOES

R.P. Hinds

Abstract: *The production of Desirée seed of different sizes (28 mm to 65 mm and over) was examined under three levels of fertilizer N - 112 kg N/ha; 135 kg N/ha and 157 kg N/ha and at three different intra-row spacings of 20.4 cm, 25.4 cm and 30.4 cm. With each level of N, 135 kg/ha of each* K_2O *and* P_2O_5 *were applied. Whole seed was planted in the size range 40-60 mm with an average seed piece weight of 61 g. Inter-row spacing was 90.0 cm.*

Fertilizer rate had no significant effect upon total yield.

Spacing had a significant effect (0.01 level) upon yield in the size range 35-45 mm, with the 20.4 cm intra-row spacing yielding the highest. Fertilizer N levels of 112 kg/ha and 135 kg/ha with 20.4 cm intra-row spacing produced significantly better yields of tubers in the size range 35-45 mm.

The optimum production technique for Desirée seed in the market size range 35-55 mm would be 112 kg N/ha at 20.4 cm intra-row spacing. Where overall excellent yields of all sizes are required, 135 kg N/ha at 20.4 -30.4 cm intra-row spacing is suggested.

EFFET DU TAUX D'APPLICATION D'ENGRAIS AZOTÉ ET DE L'ESPACEMENT SUR LE RENDEMENT DES CULTIVARS DE POMMES DE TERRE DE SEMENCE DE TYPE "DÉSIRÉE"

Résumé : *La production des semences de la variété Désirée de différentes grosseurs (28 mm à 65 mm et plus) a été étudiée en fonction de trois taux d'application d'engrais azoté, soit 112 kg d'azote à l'hectare, 135 kg d'azote à l'hectare et 157 kg d'azote à l'hectare et à raison de trois espacements différents des plants dans les rangées, soit 20,4 cm, 25,4 cm et 30,4 cm. Chaque application d'azote a été accompagnée d'une application de 135 kg à l'hectare de* K_2O *et de* P_2O_5 *. Des pommes de terre de semence entières de 40 à 60 mm ont été plantées, ces dernières ayant un poids moyen de 61 g. L'espacement entre les rangées était de 90 cm.*

Le taux d'application de l'engrais n'a eu aucun effet significatif sur le rendement global.

L'espacement a eu, quant à lui, un effet significatif (niveau 0,01) sur le rendement pour les semences de 35 à 45 mm; l'espacement de 20,4 cm ayant permis d'obtenir les rendements les plus élevés. Les niveaux d'application d'azote de 112 kg à l'hectare et de 135 kg à l'hectare avec un espacement dans les rangs de 20,4 cm ont permis d'obtenir des rendements substantiellement supérieurs de tubercules ayant de 35 mm à 45 mm de diamètre.

La technique de production optimale pour les pommes de terre de semence de la variété Désirée, afin d'obtenir la grosseur commerciale de 35 mm à 45 mm, consiste à appliquer 112 kg d'azote à l'hectare avec un espacement dans les rangs de 20,4 cm. Lorsqu'on désire obtenir d'excellents rendements globaux pour toutes les dimensions, l'application de 135 kg d'azote à l'hectare avec un espacement dans les rangs pouvant varier de 20,4 à 30,4 cm sont recommandés.

INTRODUCTION: With the growing demand for new varieties and the recent introductions of yellow-flesh foreign varieties into the NB system, there has emerged a need to establish management profiles for these new introductions. Factors which affect yield and quality such as nitrogen rates, intra-row spacings, whole versus cut seed, length of growing season, etc. must be investigated in order to provide producers with the technology required to grow these new varieties and be competitive. Desirée is a Dutch introduction being grown for the Cuban market which requires tubers in the seed size range 35 - 55 mm. This experiment was designed to examine the effects of different rates of nitrogen and intra-row spacing on the production of Desirée seed for the Cuban market as part of the process of establishing a management profile for the variety.

METHODS: The experiment was a split-plot design with four replicates.

Main plots were:

F_1 = 112 kg/ha Nitrogen
F_2 = 135 kg/ha Nitrogen
F_3 = 157 kg/ha Nitrogen

- with each application of nitrogen, 135 kg/ha each of P_2O_5 and K_2O were applied.

Sub Plots were:

Sp_1 = 20.4 cm (intra-row spacing)
Sp_2 = 25.4 cm (intra-row spacing)
Sp_3 = 30.4 cm (intra-row spacing)

Elite III whole seed was planted on June 3, and topkilled on August 28th and harvested Sept. 22nd, 1987. Inter-row spacing was 90 cm. Seed Size was 40 -60 mm. Seed piece weight was 57 - 66 g. Sub-Plot size was 0.015 hectare. Rotation practice is potatoes, potatoes, grain.

RESULTS AND DISCUSSION:

Growth and Emergence:

No differences were observed in date of emergence, growth, flowering date, tubers/hill, ease of top killing, etc. in any of the fertilizer treatments. Soil samples taken prior to planting (Table 1) below showed good nutrient status. The crop was vigorous and leaf samples taken at mid-growing season indicated excellent nutrient levels in the leaf, with the higher nitrogen levels (135 kg N/ha and 157 kg N/ha) showing a slightly better leaf N level, (Table 2). Leaf N levels at mid-season for NB over the last 10 years range from 5.5 -6.5 % N.

TABLE 1

MEAN SOIL ANALYSIS RESULTS OF MAIN PLOTS PRIOR TO PLANTING - HOLMESVILLE SOIL SERIES

Plots Treated	pH	P_2O_5 kg/ha	K_2O kg/ha	Ca kg/ha	Mg kg/ha
F_1-112 kg N/ha	5.7	513+	300	1021	155
F_2-135 kg N/ha	5.8	513+	295	1200	156
F_3-157 kg N/ha	5.9	513+	274	1059	164

TABLE 2

MEAN LEAF ANALYSIS RESULTS TO POTATO LEAVES - DESIREE MID-SEASON

Plots Treated			%				ppm			
	N	P	K	Ca	Mg	Zn	B	Cu	Mn	Fe
F_1 - 112 kg N/ha	6.2	.52	4.0	.89	.42	56	21	19	124	127
F_2 - 135 kg N/ha	6.4	.52	4.1	.78	.42	46	19	21	113	111
F_3 - 157 kg N/ha	6.5	.49	3.9	.76	.43	43	20	21	104	105

Yield:

Table 3 shows the effect of the three spacing treatments at three levels of nitrogen fertilzation on the yield of various sizes of Desirée seed.

There was no significant difference in total yield between fertilizer N rates. Nor was there any significant differences in yield of the different sizes at the three fertilizer N rates (Figure 1), though 157 kg N/ha produced the largest amount of tubers in the large size range 55-65 mm.

Intra-row spacing had a signficant effect on yield. Yield of tubers at 20.4 cm spacing in the size range 35-45 mm was significantly better (0.05 level) than yields at the 25.4 cm spacing and signficantly better (0.01 level) than yields at the 30.4 cm spacing (Figure 2). The other yield sizes were not significantly different from each other at the different spacings.

TABLE 3 - SUMMARY OF RESULTS

THE EFFECT OF THREE SPACING TREATMENTS AT THREE LEVELS OF NITROGEN FERTILIZATION ON YIELD OF DESIREE VARIETY.

	Mean Yield - Tonnes/Hectare					
	SIZES - mm					
Treatments	28-35	*35-45	45-55	55-65	65	TOTAL
1. Fertilizer Rate						
112 kg N/ha	1.96	5.42	12.29	9.51	4.34	33.52
135 kg N/ha	2.06	5.60	13.20	9.60	3.40	33.86
157 kg N/ha	2.01	4.85	12.06	11.70	2.64	33.26
Fertilizer rate not significant						
2. Spacing (Intra-Row)						
20.4 cm	2.14	6.05	12.06	10.70	2.57	33.52
25.4 cm	2.06	5.05	12.72	9.80	3.90	33.53
30.4 cm	1.83	4.77	12.76	10.33	3.91	33.60
*L.S.D. (.05) - 0.9 t/ha (.01) - 1.095 t/ha						
3. Nitrogen Rate x Spacing						
112 gk N/ha x 20.4 cm	1.93	6.50	14.15	9.77	2.18	34.53
112 kg N/ha x 25.4 cm	2.05	5.43	11.84	9.78	4.60	33.70
112 kg N/ha x 30.4 cm	1.90	4.33	10.87	8.98	6.25	32.33
135 kg N/ha x 20.4 cm	2.05	6.25	12.23	8.98	4.17	33.68
135 kg N/ha x 25.4 cm	2.20	4.88	13.02	9.80	3.83	33.73
157 kg N/ha x 30.4 cm	1.93	5.68	14.38	10.04	2.20	34.23
157 kg N/ha x 20.4 cm	2.45	5.40	9.80	13.32	1.38	32.35
157 kg N/ha x 25.4 cm	1.93	4.85	13.32	9.80	3.28	33.18
157 kg N/ha x 30.4 cm	1.65	4.30	13.05	11.98	3.27	34.25
*L.S.D. (.05) - 1.56 t/ha (.01) - 1.89 t/ha						

The relationship between fertilzer N rate and spacing produced significant differences in the size range 35-45 mm only. At spacings of 20.4 cm, 112 kg N/ha and 135 kg N/ha produced the best yeidls. The 157 kg N/ha with 30.4 cm spacing produced the worst yields of tubers in the size range 35-45 mm.

Tubers in the size range 35-55 mm are of interest to the Cuban market. Table 4 and Figure 3 show relevant data. In this size range, 112 kg N/ha at 20.4 cm spacing and 135 kg N/ha at 30.4 cm produced the best yields.

Overall, 135 kg N/ha at all three spacings produced excellent yields.

The data show evidence that low N rates with wide spacings and high N rates with wide spacings will not produce high yields of tubers in the 35-55 mm size range dictated by the market served.

TABLE 4

YIELD OF DESIREE SEED IN THE SIZE RANGE 35-55 MM AT THREE INTRA-ROW SPACINGS AND THREE LEVELS OF NITROGEN FERTILIZATION

Nitrogen x Spacing Effects	Yield Tonnes/Ha (35-55 mm)	% of Total Yield
112 kg N/ha x 20.4 cm spacing	20.65	59.8
112 kg N/ha x 25.4 cm spacing	17.27	51.2
112 kg N/ha x 30.4 cm spacing	15.20	47.0
135 kg N/ha x 20.4 cm spacing	18.48	54.9
135 kg N/ha x 25.4 cm spacing	17.90	53.1
135 kg N/ha x 30.4 cm spacing	20.06	58.6
157 kg N/ha x 20.4 cm spacing	15.20	47.0
157 kg N/ha x 25.4 cm spacing	18.17	54.8
157 kg N/ha x 30.4 cm spacing	17.35	50.7

FIGURE 1: The response of Desirée seed sizes at three levels of nitrogen fertilization

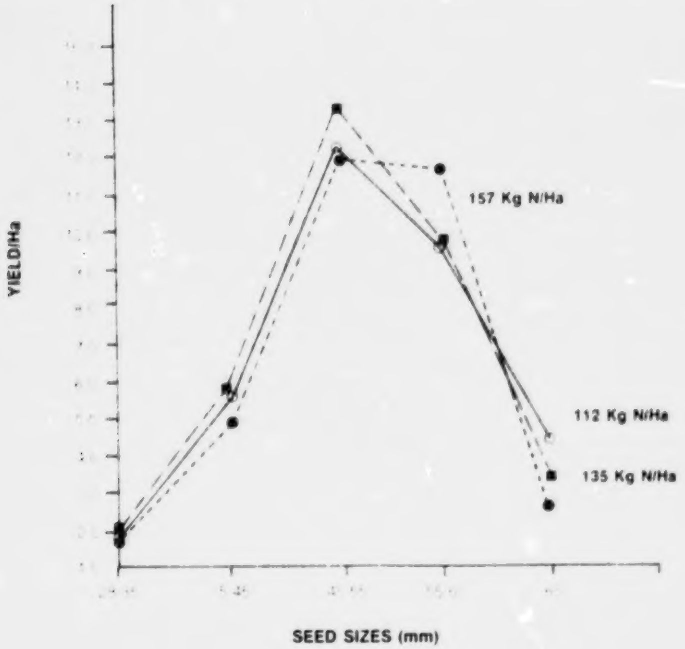
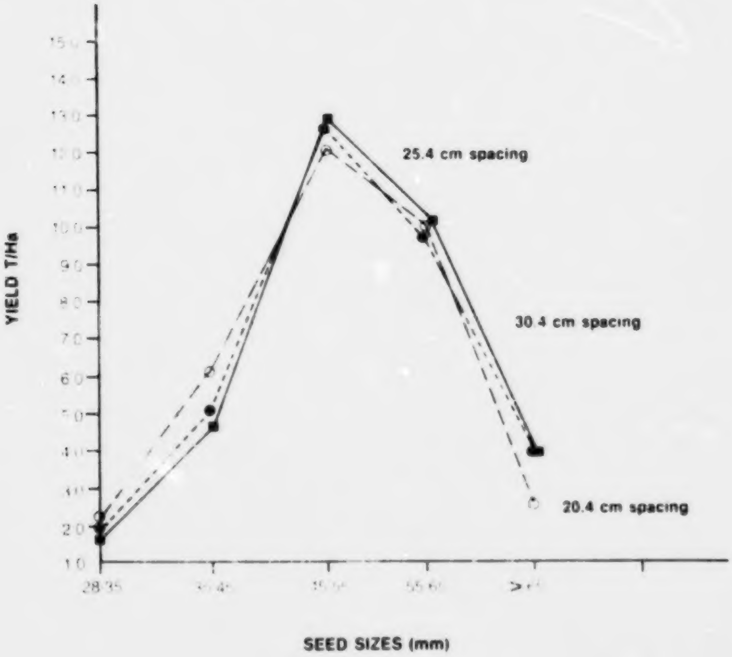


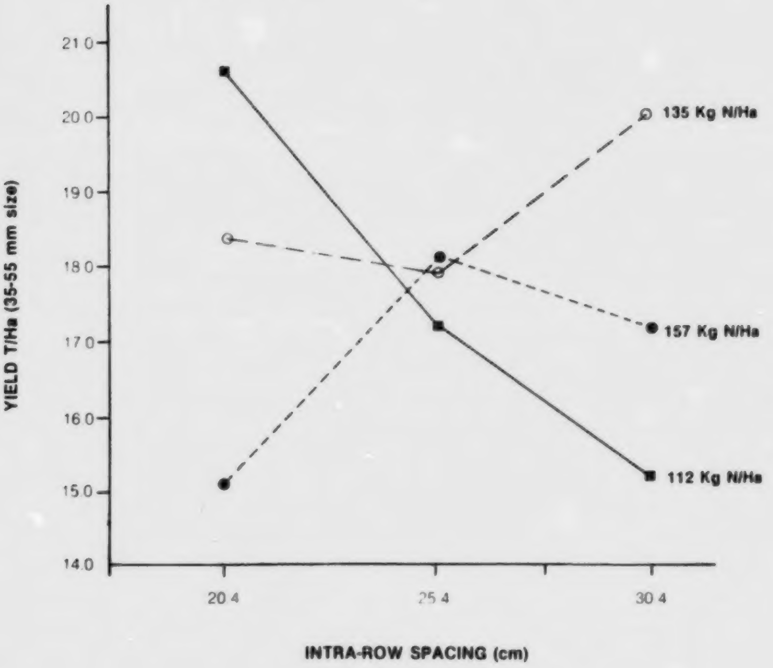
FIGURE 2: The response of Desirée seed sizes at three levels of spacings (intra-row)



CONCLUSION: There is evidence to suggest that where a low level of fertilzer N is to be applied, narrow intra-row spacings will produce the highest yield of tubers in the size range 35-55 mm. Thus 112 kg N/ha with 20.4 cm intra-row spacing is advisable if low N rates of fertilzer is the economic preference. When higher levels of fertilizer N are to be used, wider spacings will produce excellent yields in the size range. Thus where 135 kg N/ha is to be employed, intra-row spacings of 20.4 - 30.4 cm will produce excellent yields overall in the size range 35-55 mm. Very high rates of fertilizer N and very wide intra-row spacings should be avoided.

ACKNOWLEDGEMENT: The writer respectfully acknowledges the efforts of G.P. Coté during the period the work was undertaken.

FIGURE 3: The response of Desirée seed size (35-55 mm) at the three intra-row spacings to three levels of nitrogen fertilization.



SOIL AND FOLIAR APPLICATIONS OF BORON ON YIELDS OF RUSSET BURBANK POTATOES

R.P. Hinds and I. Ghanem

Abstract: Applications of boron were examined on a severely eroded podzol of the Holmesville soil series and on a slightly eroded podzol of the Glassville soil series in New Brunswick. Two basic soil applications: 0 kg/ha of boron and 2.24 kg/ha of boron were banded with the fertilizer recommendation of 1120 kg/ha of 15-15-15 at the time of planting. Foliar applications of 0.5 kg/ha and 1.12 kg/ha of boron were imposed on each basic soil treatment, at six, eight and both six and eight weeks post planting. These treatments were examined in a R C B D with four replicates. No significant differences were observed with total yield on the slightly eroded podzol, but there were significant differences on the severely eroded podzol. On the severely eroded podzol 1.12 kg/ha of boron foliar at eight weeks; 2.24 kg/ha banded alone and 2.24 kg/ha of boron banded plus 0.56 kg/ha of boron foliar at eight weeks produced significantly better total yields than where no boron at all was applied. Though not significant, the proportion of rough and knobby tubers were greater on the severely eroded soil where boron was applied compared to where no boron was applied. All boron treated plots outyielded the plots not treated with boron on both podzols.

Boron applications produced higher soil and leaf boron levels that the untreated boron plots. Soil applications up to 2.24 kg/ha of boron may be needed on eroded podzols in New Brunswick to raise soil boron levels within the sufficiency range of 0.5 - 1.0 ppm.

EFFET SUR LE RENDEMENT DES POMMES DE TERRE RUSSET BURBANK DES APPLICATIONS DE BORE DANS LE SOL ET SUR LE FEUILLAGE

Résumé : On a étudié l'effet des applications de bore dans un podzol gravement érodé de la série des sols de Holmesville et dans un podzol légèrement érodé de la série des sols de Glassville au Nouveau-Brunswick. Deux types d'application de base ont eu lieu, soit 0 kg à l'hectare de bore et 2,24 kg à l'hectare de bore combiné avec l'application en bande recommandée de 1 120 kg à l'hectare d'engrais 15-15-15 au moment de la plantation. Des applications de bore sur le feuillage à raison de 0,5 kg à l'hectare et de 1,12 kg à l'hectare sont venues s'ajouter à chaque traitement de base du sol à la

sixième et la huitième semaine, puis groupées à la sixième et à la huitième semaine après la plantation. Ces traitements ont été comparés dans un dispositif expérimental en blocs divisés au hasard, qui a été répété quatre fois. Aucune différence significative n'a pu être constatée en ce qui a trait au rendement total obtenu sur le podzol légèrement érodé, mais il y avait des différences significatives de rendement sur le podzol gravement érodé. Dans ce dernier cas, l'application sur le feuillage de 1,12 kg à l'hectare de bore à huit semaines, l'application de 2,24 kg de bore en bande à l'hectare, puis de 2,24 kg à l'hectare de bore en bande dans le sol et de 0,56 kg à l'hectare de bore sur le feuillage à huit semaines ont produit des résultats sensiblement supérieurs par rapport aux endroits où aucun bore n'avait été appliqué. Même si ces résultats ne sont pas significatifs, la proportion de tubercules durs et noueux était plus importante sur les sols gravement érodés où du bore avait été appliqué comparativement aux endroits où on en n'avait pas appliqué. Toutes les parcelles traitées au bore ont donné des rendements supérieurs aux parcelles non traitées, et ce, pour les deux types de podzol.

Les applications de bore ont augmenté la concentration de bore dans le sol et dans les feuilles par rapport aux parcelles non traitées. Les applications de bore dans le sol à raison d'un maximum de 2,24 kg à l'hectare peuvent être nécessaires sur les podzols érodés du Nouveau-Brunswick afin de porter le niveau de bore du sol à la norme recommandée, soit de 0,5 à 1,0 ppm.

INTRODUCTION: Boron is one of sixteen essential nutrient elements required to meet the needs of growing crops, and boron deficiency is fairly widespread in many parts of the world (Turner, 1982). In North America, boron deficiency, in one or more crops, has been reported in eight of the ten provinces in Canada (Hurst and MacLeod, 1936). Soils likely to be deficient in boron tend to be continuously cultivated, low in organic matter or naturally acid soils from which much of the original boron content has been removed by leaching (Bradford, 1966). Since major New Brunswick potato soils are podzolic in nature, continuously cultivated and highly eroded, boron deficiencies could be expected. Generally, potatoes grown in Atlantic Canada, are not considered to be sensitive to micronutrient deficiencies as some other vegetable crops and forages (Gupta 1968, 1972, Gupta and Cutcliffe, 1971, 1972, 1973).

McCain Foods in New Brunswick observed some benefits to potatoes from the application of boron to a previous cole crop in rotation. However, Gupta and Sanderson (1982), found no significant yield responses in Russet Burbank potatoes to boron applied as a foliar, even at rates up to 4 kg/ha banded in the soil in Prince Edward Island.

Reports out of the potato industry in New Brunswick indicate no consistent yield increases from the use of boron. It was felt that this lack of consistency may in part be due to the state of erosion in fields, whereby the more eroded but still cultivable soils gave the greatest positive response to boron applications. Because total and available boron in the soil profile are highest in surface soil (Turner, 1982), severely eroded soils would tend to have less boron than not so severely eroded soils.

The purpose of this investigation therefore, was to evaluate potato yield responses to soil and foliar applications of boron at two locations: one severely eroded and the other slightly eroded - both typical of potato soils in New Brunswick. Notwithstanding their state of erosion, New Brunswick podzols tend to be very high in phosphates and potassium.

METHODS: Field experimental plots were established at two locations. An eroded gravelly sandy loam of the Holmesville soil series, an orthic podzol, was chosen as one location. Cultivation now takes place on the C B horizon orginally 43 - 60cm below the soil surface. The other location was a slaty clay loam of the Galssville series, a humic podzol - podzol intergarde, where cultivation takes place on the Bh - Bhf horizon, originally 13 - 25cm below the soil surface.

The potato variety, Russet Burbank was planted as whole seed on randomized complete block designs with four replicates. Soil samples were taken prior to planting and every four weeks thereafter until harvest. Tissue samples representing the aerial portion of the plants were collected from each of the plots at mid-season. Plant tissue samples were placed in plastic bags dried, ground and finally analyzed for boron by the curcumin method (Jackson, 1970). The following treatments were randomized on the replicated plots where 0 and 2.24 kg/ha of boron were banded at planting with the fertilizer and seed. On these banded plots, foliar applications 0, 0.56 and 1.12 kg/ha of boron were imposed making a total of 7 treatments. Solubor was the form of boron applied as a foliar spray.

Seed source, spraying, hilling and all other activities were performed at approximately the same time at both locations. Planting date was May 20, 1982, and 1120 kg/ha of 15-15-15 fertilizer was the basic application. Russet Burbank potatoes were grown for seed at both locations.

RESULTS AND DISCUSSION YIELD: The effects of the various rates of boron on the yield of Russet Burbank potatoes are shown in Tables 1 and 2.

Although there appeared to be a slight increase in total potato yields with added boron, it was not significant on this slightly eroded Holmesville soil (Table 1). The proportion of rough and knobby tubers produced as a result of the drought at mid-season, was also not significant on this soil series. On the severely eroded Glassville soil series (Table 2), there was a significant response to boron. In total yields, 1.12 kg/ha of boron applied as a foliar eight weeks post-planting, 2.24 kg/ha of boron banded and 2.24 kg/ha of boron banded plus an additional 0.56 kg/ha of boron applied as a foliar eight weeks post-planting, produced significantly better yields than where no boron was applied.
There was also a significant difference in total yield between blocks on the upper part of the eroded slope and the lower part with yields being higher on the lower part of the slope. The data suggest a relationship between the degree of erosion and boron response. Since total and available boron are

TABLE 1

EFFECT OF BORON ON YIELD OF RUSSET BURBANK POTATOES ON SLIGHTLY ERODED GALSSVILLE SOIL SERIES

RATE OF BORON KG/HA		Tuber Size - Diameter Ranges in mm Yields T/Ha			
		30-50	51-71	Rough and Knobby	Total
BANDED AT PLANTING	FOLIAR POST PLANTING				
0	0 Control	10.47	17.23	3.79	31.49
0	1.12 at 6 wks.	14.45	17.32	3.71	35.48
0	1.12 at 8 wks.	11.49	18.33	4.03	33.85
0	0.56 at 6 and 8 wks.	12.64	17.14	5.83	35.61
2.24	0	10.74	19.17	3.44	33.35
2.24	0.56 at 8 wks.	15.38	11.02	8.52	34.92
2.24	1.12 at 8 wks.	15.00	15.00	5.85	35.85
L.S.D. P = 0.05		N.S.	N.S.	N.S.	N.S.

TABLE 2

EFFECT OF BORON ON YIELD OF RUSSET BURBANK POTATOES ON SEVERILY ERODED HOLMESVILLE SOIL SERIES

RATE OF BORON KG/HA		Tuber Size-Diameter Ranges in mm Yields T/Ha			
		30-50	51-71	Rough and Knobby	Total
BANDED AT PLANTING	FOLIAR POST PLANTING				
0	0 Control	6.81	15.80	5.78	28.39
0	1.12 at 6 wks.	8.66	9.40	11.34	29.40
0	1.12 at 8 wks.	10.93	13.06	12.04	*36.03
0	1.12 at 6 and 8 wks.	10.24	10.47	10.04	30.75
2.24	0	10.84	12.27	12.32	*35.43
2.24	0.56 at 8 wks.	8.57	14.17	12.36	*35.10
2.24	1.12 at 8 wks.	10.19	10.60	12.79	33.58
L.S.D.	P = 0.05	N.S.	N.S.	N.S.	5.60

*Significantly different from control.

highest in surface soil (Kanwar and Sigh, 1961), eroded soils would tend to have less boron than non-eroded profiles and, therefore show a greater response to boron applications. It is interesting to note, however, that even though there was no significant difference between treatments in relation to rough and knobby tubers, there were twice as many of these tubers where boron was applied as compared to where no boron was applied.

BORON CONTENT OF SOIL AND LEAF: Table 3 shows the boron content of potato leaves at mid-season with boron applications. On both soil series, leaf boron content, in general, tended to be higher on banded plots than on foliar plots. Where the foliar boron application was split, boron leaf content was the lowest of all treatments. Also in the banded plots, boron leaf content was lowest where no foliar application followed. There was no incremental leaf boron increase with increasing boron application similar to those reported by Gupta and Sanderson (1982). There was a moisture stress at mid-season and this may have affected boron availability. Turner (1982) reported that in many soils, boron is not readily available to plant roots during periods of moisture stress. Sufficiency levels of potato leaf boron content at mid-season may be between 14 - 40 ppm (Vitosh, 1979), indicting that the leaf boron content of the treatments may have been adequate under the moisture regimes then present.

Soil boron content on the banded and non-banded treatments are shown in Tables 4 and 5. Though there is some lack of agreement on the interpretation of soil test results, sufficiency levels for soils range between 1/2 to 1 ppm or boron (Turner, 1982). On the severely eroded Holmesville soil series, Table 4, where the boron was banded, sufficiency levels were attained. Soil boron levels were below the sufficiency level where no boron was applied. On the slightly eroded Glassville soil series, though boron levels were slightly higher where boron was banded, sufficiency levels were present where no boron was applied, clearly indicating that higher soil boron levels may be associated with less erosion. Yields were lowest on both soil series where no boron (banded or foliar) was applied, especially so on the severely eroded Holmesville soil series.

TABLE 3

EFFECT OF RATES OF BORON ON THE BORON CONTENT OF POTATO LEAF SAMPLES AT MID-SEASON

RATE OF B. KG/HA		ppm OF BORON IN RUSSET BURBANK LEAVES	
		Slightly Eroded Soil	Severely Eroded Soil
BANDED AT PLANTING	FOLIAR POST PLANTING		
0	0 Control	67	65
0	1.12 at 6 wks.	64	73
0	1.12 at 8 wks.	74	67
0	0.56 at 6 and 8 wks.	65	64
2.24	0	67	67
2.24	0.56 at 8 wks.	70	74
2.24	1.12 at 8 wks.	71	72

TABLE 4

EFFECT OF RATE OF BANDED BORON ON SOIL BORON CONTENT - SEVERELY ERODED HOLMESVILLE SOIL SERIES

RATE OF BORON KG/HA		ppm OF BORON IN SOIL			
		MAY*	JUNE	JULY	AUGUST
Banded	Foliar				
2.24	0	0.4	0.4	0.9	0.9
0	0	0.4	0.2	0.6	0.4

*prior to planting and banding.

TABLE 5

EFFECT OF RATE OF BANDED BORON ON SOIL BORON CONTENT -SLIGHTLY ERODED GALSSVILLE SOIL SERIES

RATE OF BORON KG/HA		ppm OF BORON SOIL SERIES			
		MAY*	JUNE	JULY	AUGUST
Banded	Foliar				
2.24	0	0.6	0.9	0.6	0.9
0	0	0.6	0.7	0.7	0.6

*prior to planting and banding.

Soil pH was not a factor affecting boron availability since the pH range of all plots were between 5.3 - 5.9, well within the soil pH range of 5.0 - 7.0 of maximum boron availability (Turner, 1982).

SUMMARY AND CONCLUSION: On the severely eroded Holmesville soil series, there was a significant response in total yield of Russet Burbank potatoes to applications of boron. 2.24 kg/ha of boron banded, 2.24 kg/ha of boron banded plus 0.56 kg/ha of boron foliar at eight weeks, and 1.12 kg/ha of boron foliar at eight weeks post planting produced significantly higher yields than where no boron was applied. Though not significant, boron-treated plots produced a higher proportion of rough and knobby tubers than the untreated plots on this severely eroded soil.

There was no significant response to boron applications on the slightly eroded Glassville soil series.

Total yield was lowest where no boron was applied on both soil series. Soil applications of boron followed by a foliar application appeared to produce higher leaf boron levels than other treatments.

On the severely eroded Glassville soil series, soil levels of boron were less than 0.5 ppm where no boron was applied. Banded applications of 2.24 kg/ha of boron raised soil boron levels within the sufficiency range of 0.5 - 1.0 ppm.

In New Brunswick, the rotation program for a seed grower is generally two successive potato crops followed by other crops for the next two years. On eroded soils, it may be advisable for a seed grower of Russet Burbank to band boron at the rate of 2.24 kg/ha to raise soil boron levels to the sufficiency level at the time of the first potato crop once in every rotation sequence. Since there is no yield decline from foliar boron applications even up to 1.12 kg/ha; in the second potato crop of a crop sequence, a foliar application of 0.56 kg/ha of boron eight weeks post planting, could be applied to maintain higher yields.

ACKNOWLEDGEMENTS: Appreciation is expressed to John MacMillan, Soil Surveyor with the New Brunswick Department of Agriculture for selecting the sites and to the New Brunswick Department of Agriculture for providing the funding for the project.

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EFFECT OF FERTILIZER RATE, SPACING AND SEED TYPE ON YIELD OF BINTJE SEED

R.P. Hinds

Abstract: *The production of Bintje seed 30-60 mm in diameter was examined under three fertilizer N rates of 100, 134 and 168 kg/ha with three spacings of 15, 20, 25 cm and two types of seed, whole and cut. Each seed piece weighed approximately 50g. A split-split plot design was employed.*

Spacing had a significant (0.01 level) effect upon yield and fertilizer x spacing also had a significant effect (.05 level) upon yield. The fertilizer N main effect by itself was not significant. Seed type had no significant effect upon yield. Nor was there any difference between the number of stems/plant produced from cut versus whole seed. Similar results have been reported for stems/plant by other workers when seed pieces of equal size are planted. Earlier emergence and growth were observed from whole seed plots.

The optimum production technique for Bintje seed 30-60 mm diameter would be 134 kg/ha of N fertilizer (or 134 kg/ha each of N, P_2O_5, K_2O) utilizing a spacing of 20 cm using either whole or cut seed. For earlier germination and reduced disease transmission, whole seed is suggested.

EFFET DU TAUX D'APPLICATION DE L'ENGRAIS, DE L'ESPACEMENT ET DU TYPE DE SEMENCE SUR LE RENDEMENT DES POMMES DE TERRE DE SEMENCE BINTJE

Résumé : *La production de pommes de terre de semence Bintje de 30 mm à 60 mm de diamètre a été examinée selon des taux d'application d'azote de 100 kg, 134 kg et 168 kg à l'hectare et avec des espacements de 15 cm, 20 cm, 25 cm et deux types de semence, soit des pommes de terre de semence entières et d'autres coupées. Chaque fragment de semence pesait approximativement 50 g. Un dispositif de parcelles fractionnées deux fois a été employé.*

L'espacement a eu un effet significatif (niveau 0,01) sur le rendement et l'effet combiné du taux d'application de l'engrais et de l'espacement a

également eu un effet significatif (niveau 0,05) sur le rendement. L'effet de l'azote en soi n'a pas été significatif. Le type de semence n'a eu aucun effet significatif sur le rendement. Il n'y a pas eu non plus de différences notables entre le nombre de tiges par plant produites que l'on ait utilisé des semences coupées ou entières. Des résultats similaires de nombre de tiges par plant ont été signalés par d'autres travailleurs aux endroits où des fragments de semences de dimension égale ont été plantés. Sur les parcelles où on avait planté des semences entières, on a noté une émergence et une croissance plus hâtives.

La meilleure technique de production pour les pommes de terre de semence de type Bintje de 30 à 60 mm de diamètre consisterait à appliquer 134 kg à l'hectare d'azote (ou 134 kg à l'hectare d'azote, de P_2O_5*, et de* K_2O*) en espaçant les semence de 20 cm, qu'elles soient entières ou coupées. Pour une germination plus hâtive et une réduction des risques de transmission des maladies, on recommande d'utiliser des semences entières.*

INTRODUCTION: Much had been said over the past few years about the need to plant small, whole seed, and the need to examine the production requirements of small, whole seed of the different varieties for a particular market in sufficient quantities.

This experiment was designed to examine the effects of fertilizer rates, seed spacing (intra-row) and seed type (whole versus cut) on the production of small whole seed in the size range of 30-60 mm in diameter for the Brazilian market.

PROCEDURE: The experiment was a split-split plot design with three replications. Main plots were fertilizer rates of 100, 134, and 168 kg/ha of fertilizer N. Each main plot was 0.132 ha in size. The first split was intra-row spacing of 15, 20, and 25 cm randomly assigned to three plots each 0.044 ha.

Within each spacing rate, further split to seed type, whole and cut (each type weighing approximately 50g) was made. Seed type was randomly assigned to these plots. Each plot was 0.02 ha.

Seed furrows and fertilizer was applied with a two-row planter. Seed was hand-planted and hand-cut to ensure proper spacing using lines with 15 cm, 20 cm and 25 cm markers accordingly.

The experiment was planted with Elite II seed on May 26th, topkilled on August 26th, and harvested September 18, 1981. Inter-row spacing was 90 cm on the Holmesville sandy clay loam in the St. Quentin area. The soil exhibiting no signs of erosion.

Main Plots - F_1 - 1008 kg/ha - 10-10-10 (100.0 kg N/ha)
F_2 - 1344 kg/ha - 10-10-10 (134.0 kg N/ha)
F_3 - 1680 kg/ha - 10-10-10 (168.0 kg N/ha)

Sub Plots - Sp_1 - 15 cm
- Sp_2 - 20 cm
- Sp_3 - 25 cm

Sub-Sub Plots - S_1 = whole seed, approximately 50 g in weight.
S_2 = cut seed piece each weighing approximately 50 g in weight.

In the split-split plot design, experimental precision increases in the order of main plot, split plot, split-split plot. Smaller differences between means are required for statistical significance in the split-split plot (seed type), than the split plot (spacing), than in the main plot (fertilizer rate).

RESULTS:

GENERAL OBSERVATIONS:

EMERGENCE: Emergence was 3 - 4 days earlier in the whole seed plots and as such, there was more rapid growth in the initial stages - this has been confirmed by other workers in New Brunswick (Barclay, 1981).

TIBERS/HILL AND ABOVE GROUND STEMS/PLANT

Counts of stems/plant above ground were made from selected plots of 50 ramdom plants, four weeks after tuberization. Data on tubers/hill and stems/plant are shown below:

	*STEMS/PLANT		NO. OF TUBERS/HILL	
TREATMENT	CUT SEED	WHOLE SEED	CUT SEED	WHOLE SEED
100 kgN/ha (20 cm spacing)	5.9 (S.D.±2.6)	5.9 (S.D.±2.9)	28	26
134 kgN/ha (15 cm spacing)	5.2 (S.D.±2.04)	5.7 (S.D.±1.8)	19	16
168 kgN/ha (25 cm spacing)	7.2 (S.D.±3.4)	5.15 (S.D.±1.5)	16	16

* S.D. = Standard deviation

The literature is replete with data showing that plants derived from whole seed produced more stems of even growth than those plants derived from cut seed, (Harris, 1978). However, Harris (1978) reported the work of Bean (1978) who showed that this premise may not be true if equal seed sizes were used. This is probably why there was such little variation in stems/plant in counts made as both the cut seed and whole seed were 50 g in weight. Indeed, Bean (1978) reported that the larger the seed size, the greater the number of stems/plant produced.

In terms of tubers/hill, the higher fertilizer rate and wider spacing had fewer tubers than other plots and this is in fact borne out in the yields subsequently to be discussed. No serious attempt was made to count tubers/hill in any detail but just to indicate the extent of tuberization in selected plots.

GROWTH: The higher fertilized plots (168 kgN/ha) produced tops which were 25% taller than the lower fertilized plot 100 kgN/ha and 10% taller than plots receiving 134 kgN/ha. Indeed, flowering was delayed in all plots which received 168 kgN/ha. At 9 1/2 weeks post planting, only the 168 kgN/ha plots still had flowers in full bloom.

YIELD: Table 1 shows the averages for treatment effects (fertilizer rate, spacing, seed type) with letter subscripts to indicate statistical significance at the 95 per cent probability level. Table 2 shows the yield data table on which statistical analyses were done and Tables 3, 4 and 5 provide auxillary data to aid in the interpretation of the data.

There was no significant differences between fertilizer rates (large differences are required to have significance in the main plots) even though the 134 kg. and 168 kgN/ha produced a higher yield than 100 kgN/ha.

Intra-row spacing had a significant effect on yield. Yields at 15 and 20 cm were equal but significantly better than yield at 25 cm. This response is typical since the closer spacings tend to produce smaller tubers.

The relationship between fertilizer rate and spacings was also significant. The worse yields were produced at the 25 cm spacing with all three levels of fertilizer. There was no difference between the yields from 168 kgN/ha combined with 20 cm and 15 cm spacings and 134 kgN/ha combined with 15 and 20 cm spacings, though the 20 cm spacings combined with both 134 kgN/ha and 168 kgN/ha produced the best yields. Economics here would dictate which fertilizer level to use since 134 kgN/ha is much cheaper than 168 kgN/ha. To produce the same yield, the judicious grower would be advised to apply the lower rate of fertilizer N.

There was no significant difference in yields between whole seed and cut seed. Even though the whole seed plots, in the earlier stages of growth seemed to be doing better, this difference did not materialize into yields. Harris (1978) reported that there are yield differences associated with the number of stems per plant as a consequence of seed type. Harris (1978) reported also the work of Bates (1978) who found that if the same seed sizes were planted, the number of stems/plant were likely to be identical and so perhaps not influence yield materially. In this case, seed size was identical and this is perhaps the reason for the lack of significance due to this treatment.

CONCLUSION: For the production of Bintje seed 30 - 60 mm in diameter under 1981 conditions, the most economical procedure is to use 1344 kg/ha 10-10-10 analysis fertilizer (or 134 kg/ha each of N, P_2O_5, K_2O) at an intra-row spacing of 20 cm using either whole seed or cut seed. While the use of whole seed gave the crop an apparent earlier start, this did not translate itself into yield over the 112 day growing period. However, this earlier emergence and growth from whole seed planting would be an advantage in some years depending on weather conditions.

ACKNOWLEDGEMENT: The writer respectfully acknowledges the efforts of Dr. R. Parry, Guy Bernard and summer students: Julie Briggs, G. Pelletier, C. Brooks and C. Jensen during the period this work was being undertaken.

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TABLE 1 - SUMMARY OF RESULTS

EFFECT OF FERTILIZER N RATE WITH THREE SPACINGS AND TWO SEED TYPES ON YIELD OF BINTJE VARIETY

TREATMENTS	*MEAN YIELD T/HA (30-60mm)	MEAN YIELD T/HA (>60 mm)	MEAN TOTAL YIELD T/HA
1. FERTILIZER RATE:			
100 kgN/ha	10.11	19.51	29.62
134 kgN/ha	11.02	15.99	27.01
168 kgN/ha	11.59	18.12	29.71
Fertilizer rate was not significant.			
2. SPACING (INTRA-ROW):			
15 cm	11.04	17.11	28.15
20 cm	11.96	17.56	29.52
25 cm	9.72	18.97	28.69
*L.S.D. (.05) - 1.175 t/ha (.01) - 1.648 t/ha			
3. FERTILIZER RATE X SPACING			
100 kgN/ha - 15 cm	10.07	18.68	28.75
100 kgN/ha - 20 cm	10.60	19.21	29.81
100 kgN/ha - 25 cm	9.64	20.68	30.32
134 kgN/ha - 15 cm	11.78	15.55	27.33
134 kgN/ha - 20 cm	12.57	15.79	28.36
134 kgN/ha - 25 cm	8.71	16.63	25.34
168 kgN/ha - 15 cm	11.28	17.08	28.36
168 kgN/ha - 20 cm	12.68	17.70	30.38
168 kgN/ha - 25 cm	10.80	19.59	30.39
*L.S.D. - (.05) - 1.43 t/ha (.01) - 2.01 t/ha			
4. SEED TYPE:			
Whole Seed	10.82	18.32	29.14
Cut Seed	10.99	17.44	28.43
Seed type was not significant.			

TABLE 2

EFFECT OF FERTILIZER RATES (3), SPACING (3) AND SEED TYPE (2) ON THE PRODUCTION OF BINTJE SEED IN THE SIZE RANGE 30-60 MM.

YIELD T/HA OF SEED 30-60 MM SIZE

		SPACING INTER-ROW					
		15 cm		20 cm		25 cm	
REPS	FERTILIZER RATE	SEED WHOLE	SEED CUT	SEED WHOLE	SEED CUT	SEED WHOLE	SEED CUT
I	100 kgN/ha	10.08	11.67	11.65	10.81	9.69	9.48
	134 kgN/ha	11.89	11.62	10.71	17.70	7.34	7.96
	168 kgN/ha	9.26	12.39	11.04	13.51	9.19	11.55
II	100 kgN/ha	7.03	8.03	12.30	9.42	8.43	9.86
	134 kgN/ha	10.11	14.01	14.04	7.03	9.94	7.78
	168 kgN/ha	10.97	11.60	12.23	14.02	11.22	11.16
III	100 kgN/ha	11.36	10.14	12.43	10.79	10.73	8.07
	134 kgN/ha	10.27	12.81	11.68	12.19	9.48	9.81
	168 kgN/ha	14.63	8.87	12.89	12.44	11.74	9.94

TABLE 3

SOIL ANALYSIS RESULTS

DATED PLANTED: MAY 26, 1981 DATE FERTILIZED: MAY 26, 1981

			kg/ha			
DATE	TREATMENT	pH	P_2O_5	K_2O	Ca	Mg
May 7	(1008 kg/ha) 10-10-10	5.3	460+	300+	800	160
June 8	(1008 kg/ha) 10-10-10	5.0	460+	300+	912	196
July 9	(1008 kg/ha) 10-10-10	5.1	460+	300+	840	140
Aug. 5	(1008 kg/ha) 10-10-10	5.1	460+	300+	800	168
May 15	(1344 kg/ha) 10-10-10	5.3	460+	300+	800	160
June 8	(1344 kg/ha) 10-10-10	5.2	460+	300+	700	152
July 9	(1344 kg/ha) 10-10-10	5.1	460+	300+	840	144
Aug. 5	(1344 kg/ha) 10-10-10	5.0	460+	300+	784	184
May 7	(1680 kg/ha) 10-10-10	5.3	460+	300+	800	160
June 8	(1680 kg/ha) 10-10-10	5.4	460+	300+	912	196
July 9	(1680 kg/ha) 10-10-10	5.1	460+	300+	800	152
Aug. 5	(1680 kg/ha) 10-10-10	4.8	460+	300+	648	172

TABLE 4

LEAF ANALYSIS RESULTS

DATE PLANTED: MAY 26, 1981

				%						ppm	
DATE	TREATMENT	N	P_2O_5	K_2O	Ca	Mg	B	Zn	Cu	Mn	Fe
July 1	15 cm spacing 1008 kg/ha 10-10-10 whole seed	6.5	.65	5.2	.91	.43	18	78	28	16	219
Aug. 1	15 cm spacing 1008 kg/ha	5.1	.31	3.6	1.2	.56	19	64	24	300	260
July 1	15 cm spacing 1344 kg/hec 10-10-10 whole seed	6.7	.58	4.8	.84	.34	21	70	21	14	195
Aug. 1	15 cm spacing 1344 kg/ha	5.6	.35	3.60	1.1	.53	16	66	25	300	151
July 1	15 cm spacing 1680 kg/ha 10-10-10 whole seed	6.2	.59	5.3	.69	.36	25	89	30	14	197
Aug. 1	15 cm spacing 1680 kg/ha	6.2	.33	3.60	1.2	.54	21	57	28	350	240

TABLE 5

KEDGWICK

RAINFALL DATA

MONTH	1981 Millimeter	1941-1970 30 YEAR AVERAGE Millimeter
May	104.5 + .9 (snow)	70.6
June	103.9	87.1
July	121.8	97.0
August	142.2	95.5
September	58.0	86.9

THE USE OF SWEET CLOVER AS A SOIL CONDITIONER

J.K. MacMillan, R. Buchanan

Abstract: *Soil samples were collected, from three sweet clover sites and from three adjacent non-clover sites, to determine what changes, if any, occurred in the soil, chemical and physical properties as a result of the sweet clover.*

UTILISATION DU MÉLILOT À TITRE D'AGENT D'AMENDEMENT DU SOL

Résumé *: Des échantillons de sol ont été recueillis dans trois champs de mélilot et sur trois sites adjacents où il n'y avait pas de mélilot afin d'établir si cette variété de trèfle entrainait des modifications dans le sol et si oui, quelles étaient les caractéristiques chimiques et physiques qui étaient modifiées par la culture du mélilot.*

INTRODUCTION: Various crops have been grown in New Brunswick specifically for improving the soil. Some are grown as green manure crops, some as winter cover crops and some, like sweet clover, provides green manure, winter cover and at the same time improves the physical condition of the soils to two feet or more through the effects of the plants deep penetrating branching tap root system.

Sweet clover is adaptable to a wide range of soil conditions. With the biennial varieties root development is at its maximum in late fall of the seeding year. The following year top growth is at its maximum in the late blossom stage.

This report is part of an on-going assessment on the use of sweet clover and other deep rooted crops as soil conditioners. We are looking at a number of factors concerning these crops in addition to their soil improvement capabilities. Among the factors being considered are ease of establishment, adaptability to various soil conditions, their value as livestock feeds and other economic benefits such as bee pasture.

MATERIALS AND METHODS: Three sites on different compact soils were examined, loose and core samples were collected for chemical and physical analysis. Complete profile descriptions were taken. Two sets of information were collected one set from a sweet clover site at blossom time and one set from an adjacent non-clover site with identical soil. The analytical methods used as listed in Table 1.

Site 1: This site was on a Holmesville loam compact ground moraine. The soil was friable to a depth of 33 cm and progressed from moderately firm to very firm at a depth of 50 cm. The soil was deep ripped and sown to clover the first year. At blossom time, it was chopped and incorporated into the cultivated layer. At blossom time, the clover was 150 cm or more in height. This site was well drained.

Site 2: This site was on a Black Land ponded marine silt. Below 40 cm the structure was coarse blocky. The site had been in continuous clover for five years or more and was used for bee pasture. The adjacent site was reverting with many alders, willows and similar brush species. The drainage ranged from imperfect to poor.

Site 3: This site was on a compact lodgement till similar to the Stoney Brook Series. The soil was firm to very firm below 25 cm. It had medium to coarse sub-angular blocky structure. Tissue samples were taken in September of the seeding year and in mid-July of the second year for feed and tissue analyses (Table 2) and soil samples were collected at blossom time. The site ranged from moderately well drained to poorly drained. Part of the poorly drained area was depressional and ponded water was common in the spring and fall. The cooperating farmer also underseeded about five acres nearby to a mixture which included sweet clover. The soil and drainage was similar but no ponding was evident.

RESULTS AND DISCUSSION: Table 3 summarizes the chemical analysis of the soil and the physical analysis where we expected to see changes occur. With sites 1 and 2, we were only interested in the physical changes and did not collect soil samples before seeding or tissue and soil samples through the growing cycles. The chemical analysis in these cases are more to indicate the range of fertility the crop is adapted to.

Site 1: At sampling time (bloom stage) the crop was tall and dense and was in the process of being chopped for green manure. Root penetration of the clover was 75 cm while the non-clover site root penetration was about 40 cm. There were changes in bulk density, pore space and permeability (Table 3). Bulk density decreased slightly at 20 to 40 cm with a larger decrease 1.38 vs 1.50 at 40-60 cm. Macro pore space increased 0-40 cm while micro pore space increased at 40-60 cm. Permeability increased in the 0-40 cm depth.

Site 2: Like Site 1, the crop was tall and dense at the time of sampling (bloom stage). Root penetration was to 90+ cm on both the clover and non-clover site. There was decrease in bulk density on the clover site from 40 to 100 cm (Table 3). Macro pore space increased in the 80-100 cm depth while micro-pore space increased from 20-100 cm. Permeability increased in the 40-100 cm depth.

Site 3: At the time of sampling (July 22, 1987), the clover was 120+ cm tall, dense and in late bloom stage. Small areas where ponding had occurred had winter killed. The soil was extremely dry to 60 cm due to the prolonged drought. The sweet clover appeared to have done well considering the soil and climate conditions. Root penetration was to 65 cm in the sweet clover site and 50 cm in the adjacent barley site. Macro pore space increased at 20-40 cm and 60-100 cm. Micro pore space increased at 0-20 cm and 40-100 cm. Permeability decreased in the 0-40 cm depths and in the 60-80 cm depth. The improvements in soil properties do not appear to be as great as Sites 1 and 2, however, they are significant when one considers that this was a heavy and compact soil from the surface and lack of rain in the growing season of the second year caused severe moisture loss in the top 60 cm. Of the three sites, Site 3 was the site we considered to be the hardest on which to establish sweet clover. The results of the tissue analysis are shown in Table 2. The cooperating farmer indicated that his cattle were eating the sweet clover as readily as other legumes. Had the samples been taken earlier in 1987, the feed analysis would have been considerably higher.

In using deep rooted crops for soil improvements, farmers look for as many benefits as possible from the crop. Abundant top growth is desirable either for green manure or livestock feed. Seed yield may be of interest to some as a cash crop or livestock feed. An abundant growth of deep roots to help improve the physical condition of compact sub soils is required. Such crops should be easily established and adaptable to a wide range of soil conditions especially drainage and fertility. Potato farmers prefer a crop that would provide these benefits on an annual basis. Other benefits, such as bee pasture, would be an added advantage to some individuals.

From the data we collected, the observations made combined with a literature review, indications are that sweet clover will provide most of the benefits desired. It is adaptable to a wide range of soil conditions. It prefers a pH of 6.0 or higher but does well at lower pH levels. Drainage does not appear to be a problem except where ponding occurs and causes winter killing. Sweet clover is rated close to alfalfa as a livestock feed and with the newer varieties available, palatability has improved and the danger of sweet clover disease practically eliminated.

The greatest abundance of roots and highest nutrient levels in them occur in late fall of the seeding year. Second year plant growth feeds on the root reserves and by the time seeds are formed, most of the root mass has been removed from the soil by the translocation of nutrients to the top growth. If the farmer is looking for a lot of top growth for green manure, he can leave the crop until blossom time or after seed harvest. If he wants to use the field the year after seeding, he can leave the crop grow to six inches and plow it down in early May. Root mass will be near maximum, the crop will have served as a winter cover crop and there is still some green manure value.

ACKNOWLEDGEMENTS: The cooperation and assistance of the following people is gratefully acknowledged. I. Breau, Max Van Cingle, Ronald Murray and family, J. Mercer, H. Cormier, J. Estey, A. Craik, and Agricultural Laboratory Staff.

TABLE 1

ANALYSIS	METHOD
pH	pH in water
P_2O_5	Phosphorus extractable by "strong". Bray extract 0.05 N NH_4 + 0.1 N HCL. .03 NH_4Ca + .025 NHCl.
K_2O Ca Mg	Extractable K, Ca, Mg. Ammonium Acetate. Extractable Cations.
Mn	Extractable trace elements 0.1 N HCL.
%OM	Wet Combustion, colorimetric method.
Bulk Density	Bulk Density-Core Method
K sat. method	Saturated Hydraulic Conductivity-Core
1/3 bar	Water Content and Water Retention (porosity). Pressure Plate Extraction.
15 bar (wilting point)	Water Content and Water Retention (porosity). Pressure Membrane Extraction.
% Sand, Silt, Clay	Physical Analysis-Particles 2mm hydrometer method.
Sand Fractions	Sieve Analysis
Est. K	1971 Journal of Soil and Water Conservation 26: 189-193.
Texture	Canadian System of Soil Classification 1978.

TABLE 2: Tissue and Feed Analysis Sweet Clover

	%					ppm				
Sample Date	**N**	**P**	**K**	**Ca**	**Mg**	**Zn**	**B**	**Cu**	**Mn**	**Fe**
Sept. 3, 1986	4.8	.32	1.6	2.5	.46	22	75	12	120	134
July 17, 1987	2.6	.28	1.1	1.2	.26	23	44	11	27	56
July 17, 1987	2.9	.27	1.3	.97	.32	42	31	10	47	74

	ADF%	TDN%	DE Mcal/Kg	Protein %
Sept. 3, 1986	17%	82%	3.6	30.0
July 17, 1987	29	67	2.9	16.8
July 17, 1987	27	69	3.1	17.2

Table 3

Site #1

	Clover					Non-Clover				
	0-20	20-40	40-60	60-80	80-100	0-20	20-40	40-60	60-80	80-100
pH	5.6	5.2	5.1	5.3		7.1	5.4	4.9	4.9	
P_2O_5 (kg/ha)	742	664	158	88		627	710	110	111	
K_2O (kg/ha)	202	135	86	119		494	130	70	87	
Ca (kg/ha)	1766	920	362	766		4172	1316	193	326	
Mg (kg/ha)	108	93	34	80		212	166	19	50	
Root Penetration				75+cm			40cm			
Bulk Density (gm/km^3)	1.29	1.33	1.38	1.66		1.25	1.34	1.50	1.62	
Macro Pore Space(%)	8.83	6.37	5.13	1.93		6.06	4.76	5.13	3.11	
Micro Pore Space(%)	42.40	43.56	42.84	35.37		46.82	44.64	38.20	35.76	
Permeability (cm/hr)	56.92	49.77	3.66	1.11		30.92	14.52	5.44	2.13	

Site #2

	Clover					Non-Clover				
	0-20	20-40	40-60	60-80	80-100	0-20	20-40	40-60	60-80	80-100
pH	6.6	7.0	7.2	7.7	7.8	5.7	7.0	7.0	7.6	7.9
P_2O_5 (kg/ha)	9	5	5	5	5	9	5	5	5	9
K_2O (kg/ha)	218	188	167	169	184	321	156	149	147	152
Ca (kg/ha)	6572	6533	6022	8832	9369	5882	6974	6322	7709	9057
Mg (kg/ha)	468	277	231	227	225	568	444	470	328	293
Root Penetration					90+					90+
Bulk Density (gm/km^3)	1.24	1.60	1.53	1.58	1.63	1.11	1.59	1.63	1.64	1.74
Macro Pore Space(%)	6.86	2.21	2.48	2.87	1.92	8.58	3.87	2.90	2.21	0.78
Micro Pore Space(%)	46.43	37.53	39.39	37.38	36.54	49.54	36.17	35.36	35.84	33.53
Permeability (cm/hr)	7.58	2.02	8.07	8.60	2.48	16.86	3.57	3.89	0.37	0.03

Site #3

	Clover					Non-Clover				
	0-20	20-40	40-60	60-80	80-100	0-20	20-40	40-60	60-80	80-100
pH	7.1	5.9	5.1	5.1	5.7	6.2	5.2	5.2	5.4	5.5
P_2O_5 (kg/ha)	113	23	10	18	51	110	44	41	74	110
K_2O (kg/ha)	185	165	116	103	106	151	68	116	99	103
Ca (kg/ha)	3848	1573	843	824	2214	1928	914	1003	1574	1802
Mg (kg/ha)	153	54	104	145	368	170	93	180	401	451
Root Penetration				65				50		
Bulk Density (gm/km^3)	1.28	1.33	1.61	1.75	1.82	1.17	1.34	1.67	1.59	1.89
Macro Pore Space(%)	4.92	6.80	3.26	1.33	0.70	10.14	5.21	3.24	0.79	0.34
Micro Pore Space(%)	46.93	42.98	36.21	32.87	30.56	45.62	44.38	33.73	31.13	28.20
Permeability (cm/hr)	0.39	1.02	0.23	0.26	0.14	15.15	2.97	0.21	0.50	0.13

AVERAGE SOIL NUTRIENT, pH AND ORGANIC MATTER LEVELS UNDER DIFFERENT FARMING SYSTEMS

John K. MacMillan, J. Mercer

Abstract: *Data from six years soil sample analysis were grouped according to farming systems to determine if there were apparent differences in nutrient, pH and organic matter levels between systems.*

NIVEAUX MOYENS D'ÉLÉMENTS NUTRITIFS, DE pH ET DE MATIÈRES ORGANIQUES DU SOL SELON DIFFÉRENTS SYSTÈMES D'EXPLOITATION AGRICOLE

Résumé : *Les données issues d'analyses d'échantillons du sol prélevés pendant six années ont été regroupées selon le système d'exploitation agricole afin d'établir s'il y avait des différences apparentes dans le niveau d'éléments nutritifs, de pH et de matières organiques d'un système d'exploitation à l'autre.*

INTRODUCTION: In the course of our field work over the past six years, over 4000 soil samples were collected for various chemical and physical analysis. Approximately one half of these had pH, available phosphorus, potash, calcium, magnesium and % organic matter analysis completed and could be correlated to a farming system type.

Differences in nutrient, pH and organic matter levels were observed which seemed to be related to the type of farming rather than to differences due to soil origin, drainage or geographical location. The purpose of this exercise was to determine if in fact differences, in nutrient, pH and organic matter levels, did occur based on four farming system classes. Potatoes - Grain, Livestock-Potatoes, Livestock and Vegetables.

METHODS: The samples collected were taken at 20 cm depth increments, 0-20,20-40,40-60 and 60-80. For most samples, the same methods were used for sample preparation and analysis as are used in doing soil samples submitted for fertilizer and lime recommendations. Some samples were collected for special studies such as Soil Profile Comparison Study (MacMillan 1986), Sweet Clover as a Soil Conditions, (MacMillan 1987). The analysis used on these samples were basically the same but more exact and the upper levels determined were much higher than those determined for fertility recommendations.

The following is a brief description of the methods. All analysis were on the 2 mm soil fraction.
pH - water paste method

Phosphorus - extraction with ammonium chloride and hydrochloric acid, determinations by Auto Analyzer.

Potash -
Calcium-
Magnesium - extraction with 1N ammonium acetate, determinations by atomic absorption.

Organic Matter - wet combustion colorimeter determination.

Except for the samples for special studies, the highest levels for the four nutrients were phosphorus 513 kg/ha, potash 336 and 430 kg/ha, calcium 4480 kg/ha and magnesium 336 and 448 kg/ha. The differences in potash and magnesium levels were due to different models of the atomic absorption spectrophotometer.

The farming system classes were quite broad and a brief description of each is as follows:

Potatoes-Grain: This class would have rotations of continuous potatoes, potatoes-grain, potatoes, peas and grain, potatoes, grain and clover or any number of combinations with potatoes making up the major portion of rotations.

Livestock-Potatoes: This is a mixed farming operation where the livestock would be either beef or dairy and the grain and forage fed on the farm. Potatoes would be the main cash crop but a much smaller part of the rotation.

TABLE 1 - AVERAGE pH, NUTRIENT & ORGANIC MATTER LEVELS

Farm Class	#	pH	kg/ha			Mg	%O.M.
			P_2O_5	K_2O	Ca		
			0-20 cm				
L	177	6.2	222	190	2,570	231	3.62
V	200	6.0	323	200	2,172	191	2.56
PG	343	5.8	453	261	1,331	192	2.70
LP	119	5.6	333	203	1,288	131	3.68
			20-40 cm				
L	146	6.0	132	127	1,591	178	2.12
V	173	5.7	154	148	1,288	119	1.10
PG	191	5.6	259	153	811	101	1.80
LP	109	5.7	222	140	937	67	2.01
			40-60 cm				
L	85	6.1	121	90	1,162	146	0.62
V	12	5.5	172	138	1,135	125	0.84
PG	137	5.5	190	119	685	84	0.74
LP	88	5.7	175	102	744	60	0.95
			60-80 cm				
L	40	6.3	93	83	2,011	168	0.28
V	4	5.6	137	89	1,033	115	0.65
PG	94	5.7	141	118	912	109	0.47
LP	62	5.8	140	90	906	85	0.54

L - Livestock
V - Vegetables
PG - Potatoes-Grain
LP - Livestock-Potatoes

Vegetable: This class would include small fruits and would also be a mixed farming operation. The vegetables and fruits would be the main cash income and other crops or livestock are mainly sidelines. Next to Potatoes-Grain, this would probably be the most intensive class of agriculture.

Livestock: This class would include dairy and beef operations with the rotation being mainly grain, forage and pasture designed to provide much of the nutrient requirements of the livestock.

RESULTS: The average nutrient, organic matter and pH levels by depth and farming system are shown in Table 1. As stated in the introduction, the purpose of this study was to determine if there were differences in nutrient, organic matter and pH levels based on four broad farming classes. Considering the fertility programs and intensity of cultivation, the data in Table 1 does follow the expected trends quite closely.

SAWDUST AS ANTI-CRUSTANT IN DIRECT SEEDED VEGETABLE PRODUCTION

K.T.V. Michalica

Abstract: *The effectiveness of sawdust as an anti-crustant on carrots, beets and direct-seeded chinese cabbage, cauliflower and broccoli were evaluated in field conditions on two contrasting soils. The early emergence was more than doubled and further crop development was significantly improved. Crop uniformity and quality was also remarkably improved. The results warrant commercial application both in garden and commercial conditions.*

UTILISATION DU BRAN DE SCIE À TITRE DE PRODUIT ANTI-CROÛTE DANS LES SEMIS DIRECTS DE LÉGUMES

Résumé *: L'efficacité du bran de scie à titre de produit anti-croûte pour les carottes, betteraves et choux chinois semés directement ainsi que pour les choux-fleurs et les brocolis a été évaluée dans les champs sur deux sols de type contrastant. Le nombre de légumes sortis de terre hâtivement a plus que doublé et le développement ultérieur de la récolte s'est amélioré de façon significative. L'uniformité de l'apparence des légumes et leur qualité ont également été améliorées d'une façon tout à fait remarquable. Les résultats sont suffisants pour justifier une application commerciale tant dans les jardins potagers que dans des exploitations commerciales.*

INTRODUCTION: The evaluation of various anti-crustants for direct seeded vegetable crops was initiated in the Province in 1981. Many synthetic and naturally occurring substances have been tested since then. Sawdust was proven as the most effective, reliable, non-toxic and readily available material that can further enhance crop development and have a beneficial effect on soil.

The mechanisation of sawdust placement as well as the preliminary economy of sawdust placement were evaluated during 1983 through 1985. By now the technology has proven effective in production of direct seeded carrots, parsnips, beets, cabbage, broccoli and cauliflower. The limiting factors in the technology adaption are at the present the availability of mechanization (only one sawdust spreader has been developed in the Province) and the information transfer.

MATERIALS AND METHODS: The test plots were located on two commercial fields in Young's Cove and Maugerville. The chinese cabbage was seeded into soil that was classified as the Mount Hope soil series (loam over clay loam) while carrots, beets, cauliflower and broccoli were established on Interval silt loam soil series.

Chinese cabbage was seeded into a four acre field that had been prepared by rototiller. All but one seeded row were covered by sawdust with the rate of approximately 5 m^3 per hectare. The untreated row was used as a control.

The remainder of the test plots were established in Maugerville on the soil representing the typical lower St. John valley soil. The seedbed was prepared by rototiller. Two rates of sawdust, namely 5 m^3 and 10 m^3 of sawdust were applied. Sawdust was applied directly over the seeded row, immediately following seeding, in a 10 centimeter wide strip. The lower rate was sufficient to cover the row entirely by a very thin layer. The higher rate enabled us to apply a sawdust layer approximately 0.3 cm thick.

There was a rain shower shortly after seeding of Chinese cabbage. After seeding of the second field trial, an artificial "rain" was applied by a commercial sprayer with the intention of simulating the conditions during the natural course of an average rain and an intensive storm.

RESULTS AND DISCUSSION: Sawdust application on direct seeded Chinese cabbage increased the number of plants (heads) by 151 percent (Table 1). The heads of the rows treated with sawdust also appeared to be tighter and firmer in comparison with those grown on the untreated plot.

The early emergence of carrots and beets, evaluated seven days after seeding, was increased by 128 and 170 percent respectively (Table 2).

The early emergence of cauliflower and broccoli was increased by application of sawdust mulch by 112 to 143 percent (Table 3). The differences between lower and higher rates of sawdust were insignificant. The plant density, as evaluated by a second count 42 days after the seeding, was increased by sawdust mulch by 54 to 291 percent. The positive effect of mulch on emergence of broccoli was more pronounced and further increased with time in comparison to cauliflower. The higher rate of sawdust increased the density of both cauliflower and broccoli (Table 3). Dry and hot weather following seeding increased the sawdust's effectiveness. Remarkable differences were measured between treated and untreated plants in crop development. The average number of cauliflower and broccoli leaves on untreated plots were 3 and 3 to 4 respectively, mulched plants developed from 4 to 5 leaves. The estimated mass of plants evaluated 42 days after seeding was increased by 214 to 969 percent using the lower sawdust rate and by 383 and 783 percent respectively by application of the higher rate.

RECOMMENDATIONS: The technology that has been developed and improved over the past four years is now ready to be implemented by both home gardeners and commercial growers. The promotion of the technology and availability of the mulch placement mechanization are the key elements of its adaption. Further evaluation of mechanization, economy and suitability to variety of crops should continue.

ACKNOWLEDGEMENTS: The co-operation and assistance of producers Karl and Gordon Harvey and Regional Slocum and André Levesque, summer student with N.B.D.A. during data collection has been greatly appreciated.

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Table 1. The Effect of Sawdust Mulch on Plant Density of Direct-seeded Chinese Cabbage (Counted on August 24, 1987)

Replicate	Plant Count per 3 m Row Bare Soil			Sawdust Covered		
	Single Row	Single Row	Double Row Total	Single Row	Single Row	Double Row Total
1	11	18	29	39	34	73
2	20	18	38	36	38	74
3	23	16	39	42	43	85
4	14	8	22	44	44	88
5	19	18	37	57	35	82
Total			165			412
%			100.0			251.0

Table 2. The Effect of Sawdust Mulch on Plant Emergence of Carrots and Beets (Counted on July 20, 1987, "storm" intensity of water spray was used.)

Replicate	Plant Count per 3 m Row Carrots		Beets	
	Bare Soil	Sawdust Covered	Bare Soil	Sawdust Covered
1	25	60	18	59
2	39	61	21	46
3	15	59	15	41
Total	79	180	54	146
%	100.0	228.0	100.0	270.0

Table 3. The Effect of Sawdust Mulch on Emergence of Broccoli and Cauliflower. (First Count on July 20, Second Count on August 24, 1987.)

Cauliflower, First Count

Replicate	Plant Count Per 3 m Row			
	Bare Soil		Sawdust Covered	
	Storm	Rain	$5m^3/ha$	$10m^3/ha$
1	2	30	42	61
2	21	30	42	35
3	21	40	55	62
4	50	50	60	61
Total	94	150	199	219
%	100.0	160.0	212.0	233.0

Cauliflower, second count

Replicate	Plant Count Per 3 m Row			
	Bare Soil		Sawdust Covered	
	Storm	Rain	$5m^3/ha$	$10m^3/ha$
1	57	54	62	53
2	37	65	56	58
3	24	57	35	66
4	29	27	74	82
Total	147	203	227	259
%	100.0	138.0	154.0	176.0

Broccoli, first count

Replicate	Plant Count Per 3 m Row			
	Bare Soil		Sawdust Covered	
	Storm	Rain	$5m^3$/ha	$10m^3$/ha
1	15	14	31	28
2	8	34	26	32
3	14	36	33	31
4	19	24	45	40
Total	56	108	136	131
%	100.0	193.0	243.0	234.0

Broccoli, second count

Replicate	Plant Count Per 3 m Row			
	Bare Soil		Sawdust Covered	
	Storm	Rain	$5m^3$/ha	$10m^3$/ha
1	11	30	46	29
2	13	11	35	36
3	8	30	35	60
Total	32	71	116	125
%	100.0	222.0	363.0	391.0

Table 4 The Effect of Sawdust Mulch on Development of Broccoli and Cauliflower (Evaluated 42 days after seeding)

Crop	Measurement	Bare Soil		Sawdust covered	
		storm	rain	5m/ha	10m/ha
Cauliflower	Average heights of plants, cm	4.3	5.7	7.3	12.3
	Average mass of plants, %	100.0	166.5	314.0	483.1
	Average no. of leaves	3	3-4	4-5	4-5
Broccoli	Average heights of plants, cm	5.0	5.7	7	8.7
	Average mass of plants, %	100.0	194.0	569.2	833.3
	Average no. of leaves	3-4	4	5	5

EFFECTS OF DEEP RIPPING FOLLOWING TILE DRAINAGE ON CROP PRODUCTION

K.T.V. Michalica

Abstract: *Both yield and quality of potatoes were positively affected by ripping even though to a small degree. The yield differences between ripped plots and control were much more pronounced on barley and sweet clover.*

EFFETS DU LABOUR PROFOND SUIVANT LE DRAINAGE PAR TUYAUX SUR LA PRODUCTION DE POMMES DE TERRE

Résumé *: Le rendement et la qualité des pommes de terre ont été améliorés à un faible degré, toutefois, par un labour profond. Les différences de rendement entre les parcelles labourées et les parcelles témoins ont été beaucoup plus prononcées pour l'orge et le mélilot.*

INTRODUCTION: The 1987 growing year was the second season following soil improvements by tiling and ripping. The main objective of the data collection during 1987 was to evaluate the effects of various soil (subsoil) treatments on the performance of three crops which differ in both their requirements and effects on soil.

MATERIALS AND METHODS: The field, consisting of seven plots (four deeply ripped treatments, one control and two naturaly better drained plots located on the upper part of the field) were divided into twelve sections in the east-west direction (along the slope) and three crops, namely potatoes (Shepody), barley underseeded with red clover (Herta and Canada Common) and sweet clover (Canada Common) were grown within the designated strips throughout each treatment.

The stand of potatoes was uniform and progressed satisfactorily throughout the growing season. The stand of barley varied somewhat and the stand of sweet clover was much less uniform. Plots D, E and F (Figure 1) were weedy and showed signs of lack of fertility towards the end of the growing season.

The plots were harvested manually, with four or three replicates were obtained from each plot. The size of individual sample was 10 linear meters of potato row, 3.3 square meters of barley and 1 square meter of sweet clover. Yield data of barley were collected following the swathing.

Ten water table measuring wells were established, two at each site, throughout the test area (Figure 1). One well, 60 cm long, was perforated through its entire length and imbedded into a permeable soil material. The second well, 90 cm long, was perforated at the bottom 25 centimetres and the soil around the well was sealed at 30 centimetres below the soil surface.

RESULTS AND DISCUSSION: The potato yields among various soil treatments varied only marginally. The yield ranged from 29.0 to 32.4 T/ha. The highest yield was harvested from plots A and B (ripped along with the tiles). The lowest yield and also the highest cull content were measured at plot D (control). Both plots E and F (ripped across the tiles) produced high yield of low cull content (Table 1). The specific gravity varied only slightly among various treatments-ranging from 1.0728 to 1.0768 g/cm^3. The tubers harvested from plot D (control) had the second lowest specific gravity value (Table 2).

Yields of barley varied much more among the different treatments than that of potatoes. The yield ranged from 2.20 to 3.98 T/ha. Plots A and B (ripped along with the tiles) again yielded the best. The plot D (control) yielded the lowest of all plots.

The yield of sweet clover varied widely among as well as within test plots. Plot D (control) yielded the least again. The variation as well as low yield from some plots were affected by low fertility and competition from weeds.

Water table data collection was affected by dry weather during the summer and fall of 1987. No water table was found within 80 cm below the soil surface at any of the established water wells prior to October 16, 1987 (Table 3).

Even though soil surface was ponded and water saturated on numerous places throughout the field during late October and early November to the point that it made potato harvest difficult, this was not reflected in water table data. One can only assume that impeded drainage is caused by very slow downwards water movement through the soil surface as well as through the subsoil.

RECOMMENDATIONS: The yield data collected during 1987 are encouraging and support the experimental data and common practice that is taking place in Europe, recommending subsequent ripping of tiled soils with heavy, compacted subsoils.

Further work is needed not only to evaluate effects of ripping on various crops but also the benefits of growing deep rooted crops in sustaining openings and channels produced by ripping. Further work is also needed to eliminate or diminish the influence of yearly variation of weather patterns. Another year of yield and soil data collection is needed to complete the crop rotation cycle before the entire test field will be seeded to potatoes in 1989 when final yield and soil data will be collected.

ACKNOWLEDGEMENTS: Financial support of the Technology Demonstration Program of AFA for this project has been greatly appreciated. The co-operation and assistance of Gilles Godbout a producer of St. André, Jacques Lavoie, Technician and André Levesque, summer student, both of NBDA is acknowledged and appreciated.

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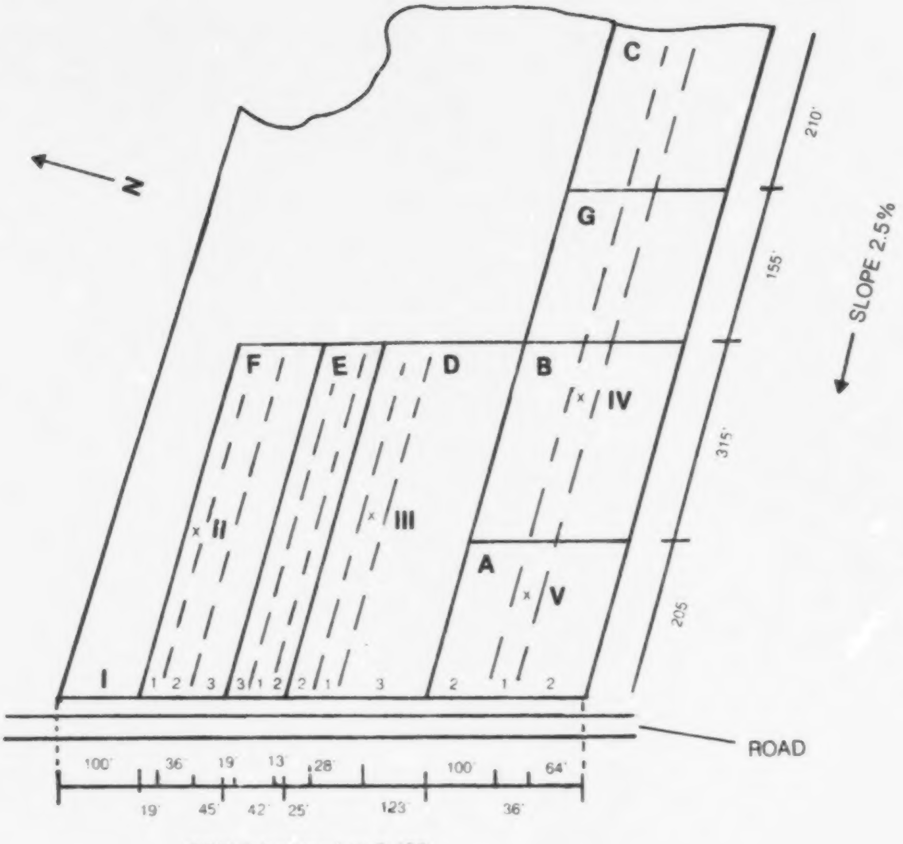
Figure 1. Plot Layout
1987


N
C
G
F
E
D
B
IV
II
III
A
V
I
1 2 3 3 1 2 2 1 3 2 1 2
210'
155'
315'
205'
SLOPE 2.5%
ROAD
100' 36' 19' 13' 28' 100' 64'
19' 45' 42' 25' 123' 36'

SCALE (approx.) 1: 2,400

A - tiled, subsoiled along tile; 7 ft. spacing, 36 in. depth
B - tiled, subsoiled along tile; 4-5' spacing, 36 in. depth
C - non-tiled, non-subsoiled
D - tiled only
E - tiled, subsoiled across tile; 4-5' spacing, 22 in. depth
F - tiled, subsoiled across tile; 6-7' spacing, 22 in. depth
G - tiled only

I, II, III, IV, V - water table wells
1 - sweet clover
2 - potatoes
3 - barley underseeded with red clover

Table I.

Effects of Deep Ripping on Yield and Quality of Potatoes

		Yield of Tubers									
	Replicate	Can.#1 Lg.		Can.#1		Can.#2		Culls		Total	
Plot		kg/10m	% Total	kg/10m	% Total	kg/10m	% Total	kg/10m	% Total	%	T/ha
A	1	0.23		28.67		1.54		2.54			
Ripped	2	--	2.9	25.54	80.2	1.54	6.9	5.31	10.0	100.0	32.0
along	3	2.18		24.04		2.63		2.50			
tiles	4	1.36		24.40		3.04		2.31			
7',36"											
B	1	0.36		30.71		2.09		3.54			
Ripped	2	2.63	7.6	22.09	78.0	2.09	6.4	3.13	8.0	100.0	32.4
along	3	1.04		24.99		2.50		2.54			
tiles	4	5.85		23.27		1.68		1.13			
4-5',36"											
C	1	1.36		29.71		2.54		2.31			
(Control)	2	0.73	2.9	28.67	87.2	1.95	5.6	1.04	4.3	100.0	31.7
Not tiled	3	0.68		29.53		0.91		1.63			
not	4	0.54		22.68		1.77		0.45			
ripped											
D	1	1.18		27.22		1.18		1.00			
Control	2	--	2.1	27.04	86.4	1.04	4.0	2.04	7.5	100.0	30.0
tiled,	3	--		24.72		0.59		3.18			
not ripped	4	1.36		24.54		1.95		2.72			
E	1	3.63		25.86		3.45		1.72			
Ripped	2	0.82	4.2	28.12	84.7	2.95	7.0	1.63	4.1	100.0	31.9
across	3	0.45		26.31		1.59		0.59			
tiles	4	0.49		27.67		0.91		1.23			
4-5',22"											
F	1	0.82		22.68		4.22		1.23			
Ripped	2	1.95	2.8	27.13	82.8	3.36	10.4	1.04	4.0	100.0	31.4
across	3	0.77		27.22		4.04		1.09			
tiles	4	--		26.94		1.36		1.68			
6-7',22"											
G*	1	--		19.98		1.18		3.22			
(Control)	2	0.91	0.8	25.99	85.6	2.99	4.9	1.45	8.7	100.0	29.1
tiled, not	3	--		21.55		1.32		4.08			
ripped	4	--		31.84		0.27		1.36			

* wet, stony sampling site

Table 2.

Effects of Deep Ripping on
Specific Gravity of Tubers

Plot	Replicate	Specific gravity g/cm^3	Average Specific gravity g/cm^3
A	1	1.0804	1.0754
	2	1.0783	
	3	1.0690	
	4	1.0740	
B	1	1.0715	1.0752
	2	1.0750	
	3	1.0775	
	4	1.0767	
C	1	1.0746	1.0741
	2	1.0768	
	3	1.0757	
	4	1.0694	
D	1	1.0787	1.0732
	2	1.0737	
	3	1.0710	
	4	1.0694	
E	1	1.0713	1.0728
	2	1.0744	
	3	1.0737	
	4	1.0718	
F	1	1.0732	1.0768
	2	1.0188	
	3	1.0782	
	4	1.0772	
G	1	1.0773	1.0768
	2	1.0759	
	3	1.0837	
	4	1.0702	

Table 3

Effects of Ripping on Yield of Barley and Sweet Clover

Plot	Yield of barley (grain) T/ha	Yield of sweet clover (green matter) T/ha
A	3.98	52.6
B	4.62	54.0
C	2.82	58.5
G	3.79	55.8
D	2.20	18.1
E	3.07	39.0
F	3.10	45.4

Table 4

Water Table Depth Below Soil Surface

Water well site #	Plot	Depth of well below soil surface cm	Water table depth below soil surface, cm			
			Date of measurement			
			prior to 16/10	16 10*	12/11	19/11.
1	-	50	- +	-	47	45
		80	-	74	75	38
2	F	50	-	-	-	38
		80	-	-	-	-
3	D	50	-	-	-	-
		80	-	-	-	-
4	B	50	-	-	-	44
		80	-	-	-	66
5	A	50	-	-	-	-
		80	-	79	-	71

+ not observed within the water well depth
* after prolonged dry weather
. after substantial precipitation

IMPROVED FERTILITY PRACTICES IN CARROT PRODUCTION ON ACID PEAT SOIL

K.T.V. Michalica

Abstract: *Severe molybdenum deficiency of the carrot stand grown on acid peat (spagnum) soil was diagnosed in early summer of 1987. The stand responded to, and was significantly improved by, foliar application of sodium molybdate during August of 1987. The carrot production from the same area was doubled in 1987 in comparison to that of 1986.*

The fertilization practices as used until 1987 were not only imbalanced but also excessive. The highest yields of carrots were obtained from commercial plots that received only 25% and 50% of the 1987 fertility rate.

NPK plots outyielded N plots; plots where urea was used as a nitrogen source outyielded those treated with ammonium nitrate during 1987.

MEILLEURES PRATIQUES D'ENRICHISSEMENT DU SOL POUR LA PRODUCTION DE CAROTTES SUR DES SOLS TOURBEUX ACIDES

Résumé *: De graves déficiences en molybdène d'un peuplement de carottes cultivées sur un sol tourbeux acide (sphaigne) ont été diagnostiquées au début de l'été 1987. Le peuplement a bien réagi (et la situation a pu être grandement améliorée) à l'application sur le feuillage de molybdate de sodium au mois d'août 1987. La production de carottes sur une surface équivalente a doublé en 1987 comparativement à celle de 1986.*

Les pratiques de fertilisation du sol utilisées jusqu'en 1987 n'étaient pas seulement déséquilibrées, mais également excessives. Les rendements les plus élevés de carottes ont été obtenus de parcelles commerciales sur lesquelles les taux d'application d'engrais étaient de 25 % et de 50 % inférieurs à ceux de 1987.

Les parcelles ayant reçu du N, du P et du K ont eu des rendements nettement supérieurs aux parcelles n'ayant reçu que de l'azote. Les parcelles où de l'urée a été utilisée à titre de source d'azote ont eu un rendement supérieur à celles traitées avec du nitrate d'ammonium en 1987.

INTRODUCTION: The first attempts to introduce commercial vegetable production on the acid peat soil of St. Charles bog goes back to the late 1950's. Since the first trial runs many serious production problems were encountered and resolved. Among others, substantial improvements were made in drainage, soil preparation, liming, seeding, rolling, crop and variety suitability, and pest and weed control. Due to the initiative and perseverance of the personnel of St. Charles Vegetable Producers Co-operative, New Brunswick Department of Agriculture and Agriculture Canada, quality vegetables (carrots, celery, broccoli and lettuce) are now produced on some 45 hectares of improved bog.

Increasingly serious carrot production problems were reported during the winter of 1986-1987. After the symptoms were described, they appeared to be soil nutrition related. Tests were initiated that would result in information needed to counter them if they re-appear.

The carrot emergence in 1987 was quite uniform. Soon after though, young plants slowed in growth, many started to appear yellowish or bronze in color and some fields, particularly those in the new developments (less decomposed), appeared very patchy. After close examination of symptoms on the individual plants, it was determined that older leaves were yellowing and browning while the growing centre was still healthy. Micronutrient imbalance was most likely to be the cause.

After application of several micronutrients as a foliar spray, only molybdenum had any positive effect on treated plants. The management of the St. Charles Co-operative was advised to spray the carrot acreage with sodium molybdate. Even though the crop responded to the spray, some poor stands remained. In a two-week interval, another spray of molybdenum fertilizer was applied.

Even though the carrot crop never reached its production potential, 1987 carrot yields doubled in comparison to the harvest in 1986 from approximately the same acreage. The concentration or availability of molybdenum is related to soil acidity, concentration of phosphorus, copper, boron, sulphur, manganese, iron, aluminum and other elements, and was the single element limiting carrot production from St. Charles bog until 1987. This finding was confirmed by the research work of Mr. Paul LeBlanc of Agriculture Canada who received very significant carrot production improvement by soil application of molybdenum.

MATERIALS AND METHODS: Three major areas were tested using portions of commercially managed fields as follows:

1. Micronutrient deficiency
2. NPK excess
3. NPK balance and the most suitable source of nitrogen.

Micronutrient deficiency was tested by foliar application of solutions or suspensions of fertilizers containing separately the following elements: copper, boron, zinc, iron, manganese and molybdenum. The recommended commercial rates and the wetting agent "Assist" were used. The effect of foliar applications of micronutrients was evaluated by visual observation.

The commercial fertilization rate on St. Charles Bog in 1987 was as follows: 300-300-150 lbs of NKP, 50 lbs of copper sulphate and 5 lbs. of Borax per acre. In order to assess NPK excess, several plots of 50% and 25% of fertilizer's rate were placed among the full commercial rate treated plots.

Three additional trials were established within commercial fields; first, complete NPK with urea used as a source of nitrogen, second, complete NPK with ammonium nitrate used as a source of nitrogen and third, N only.

Three replicates and a control were established within each trial; carrots were harvested, sorted and weighed manually.

RESULTS AND DISCUSSION: Only foliar addition of molybdenum has positively affected carrot stand. The foliar applications of any other tested micronutrient did not improve, and in some instances further damaged, nutrient - imbalanced plants.

The excess of NPK fertilization was demonstrated by the higher carrot yield obtained from plots which received only 25 or 50% of the fertilizer in comparison with the yield from the fully fertilized plots.

The results of the trial are summarized in Table 1.

The plots treated with the full rate of urea outyielded the plots where the full rate of ammonium nitrate was used. The results of this trial are summarized in Table 2.

The yield of carrots was increased by additions of potassium and phosphorus in comparison with application of nitrogen alone. The results of the trial are summarized in Table 3.

Table 1. Effect of the Rate of NPK and Micronutrients on Carrot Yield

Field Description	Rate of Fertilizer Applied, %	Yield of Carrots T/ha	%	Proportion of Canada #1, %
Well decomposed	100	10.5	100	N.D.*
Well yielding	50	13.4	128	N.D.
Field #20	25	10.2	97	N.D.
Poorly decomposed	100	2.3	100	50
Well yielding	50	4.0	173	63
Field #43	25	10.2	435	57
Poorly decomposed	100	1.2	100	34
Poorly yielding	50	1.3	112	30
Field #44	25	2.5	215	80

*N.D. not determined

Table 2: Effect of the Form of Nitrogen on Carrot Yield. (Well Decomposed, Well Yielding Field)

Source of Nitrogen	Yield of Carrots	
	T/ha	%
Ammonium Nitrate	10.5	100
Urea	13.2	126

Table 3. Effect of Fertility on Carrot Yield. (Well Decomposed, Well Yielding Fields #18 and 20.)

Fertilizer Applied	Yield of Carrots	
	T/ha	%
NPK + micronutrients	13.6	100
N + micronutrients	10.2	75

CONCLUSIONS: Diagnosing molybdenum deficiency in early summer enabled the grower to apply molybdenum fertilizer over the entire acreage within the production year. This procedure substantially increased yield.

An "old" development (well decomposed peat), fertility rate of 50% substantially outyielded the full rate while 25% of rate was only slightly different from full rate. On "new" development (poorly decomposed peat), a fertility rate of 25% substantially outyielded 50% rate and more substantially 100% rate.

NPK plots outyielded N plots, the full rate of urea outyielded the full rate of ammonium nitrate.

RECOMMENDATIONS: 1. 1988 fertility recommendations will include molybdenum. The method of application and rate should be determined by greenhouse testing prior to 1988 growing season and further refined by field testing.

2. NPK fertilization should be revised. Reduction of both nitrogen and phosphorus should be adopted.

3. Alternative nitrogen fertilizers should be sought so that the problem of lowering soil pH by additions of fertilizers will be eliminated or at least curbed.

4. Further testing should be conducted to evaluate urea as a source of nitrogen in comparison to ammonium nitrate.

5. The rate of copper that affect the availability of molybdernum should be re-evaluated.

ACKNOWLEDGEMENTS: The co-operation and assistance of the management and members of the St. Charles Vegetable Producers Co-operative Ltd. were greatly appreciated. The assistance of Mr. Jacque Lavoie, Technician of N.B.D.A. and Mr. André Levesque, summer student during management and harvest of test plots and data colelction is acknowledged and appreciated.

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MODIFYING SOIL TEMPERATURES

George Read

Abstract: *The effects of applying a clear polymulch, a black polymulch and a spray application of powdered charcoal were compared to bare ground at depths of 3 cm, 10 cm, and 20 cm. As expected, clear poly produced the warmest temperature modification of all depths. Black poly and charcoal produced very similar results and were both cooler than the clear poly. At 10 and 20 cm depths the spray charcoal produced 1-2°C warmer maximum temperatures than the black plastic mulch.*

MODIFICATION DE LA TEMPÉRATURE DU SOL

Résumé : *Les effets de l'application sur le sol d'un paillis plastique transparent et d'un paillis plastique noir, ainsi que d'une pulvérisation de charbon en poudre ont été comparés sur un sol nu à des profondeurs de 3 cm, 10 cm et 20 cm. Comme on pouvait s'y attendre, le paillis plastique transparent a permis d'obtenir les températures les plus élevées à toutes les profondeurs. Le paillis plastique noir et le charbon ont permis d'obtenir des résultats à peu près semblables, bien que dans les deux cas, les températures du sol étaient inférieures à celles obtenues au moyen du paillis plastique transparent. À des profondeurs de 10 cm et 20 cm, le charbon de bois a permis d'obtenir des températures maximales plus élevées de 1 °C à 2 °C que celles obtenues au moyen d'un paillis plastique noir.*

INTRODUCTION: Warming of soil temperatures is particularly important under New Brunswick growing conditions. Cool temperatures in the spring are often implicated for poor germination and favourable for disease development.

Clear polyethelene mulch has been demonstrated to elevate soil temperatures substantially but has the drawback of improving germination and growth of weeds. Black polyethelene mulch has not demonstrated substantial soil temperature increases at normal rooting depths. This has been speculated to occur as a result of the poor contact with the plastic layer and the soil surface. Black plastic does however provide excellent weed control.

In an attempt to provide a better surface contact with the soil and to investigate the potential of a spray application of a soil darkening material. Charcoal was used as a possible temperature modification material. This relatively inexpensive material and the ease of application may make this a desirable alternative for earlier germination and growth of some crops.

MATERIALS AND METHODS: Shielded thermistors (to measure temperature) were placed at depths of 3 cm, 10 cm and 20 cm in undisturbed soil in four separate locations.

A trench was dug adjacent to the test plots and the temperature sensors were installed horizontally so as not to dislocate the soil surface. Clear poly, black poly, charcoal and control plots were installed over the temperature sensors.

Temperatures were recorded at 3 hr intervals for a 15-day period at all depths in all treatments and stored on two Campbell Cr21 dataloggers.

The charcoal was applied using a solo backpack sprayer in a solution of water.

The application rate was sufficient to completely darken the surface. Following a rainstorm the surface was reapplied during the 15-day trial.

RESULTS AND DISCUSSIONS: The 3 hr temperatures over the 15-day trial are presented in figures 1,2, and 3 representing the following depths, 3 cm, 10 cm and 20 cm respectively.

The clear poly provided the greatest increase in temperature. The black plastic and charcoal were very similar. At the deeper depths the charcoal was warmer than the black plastic, suggesting that the better surface contact resulted in deeper heating from conduction.

Several questions remain unanswered regarding the use of a spray charcoal as an alternative to plastic.

1) Methods must be developed to improve the durability of the charcoal surface during rain or irrigation.

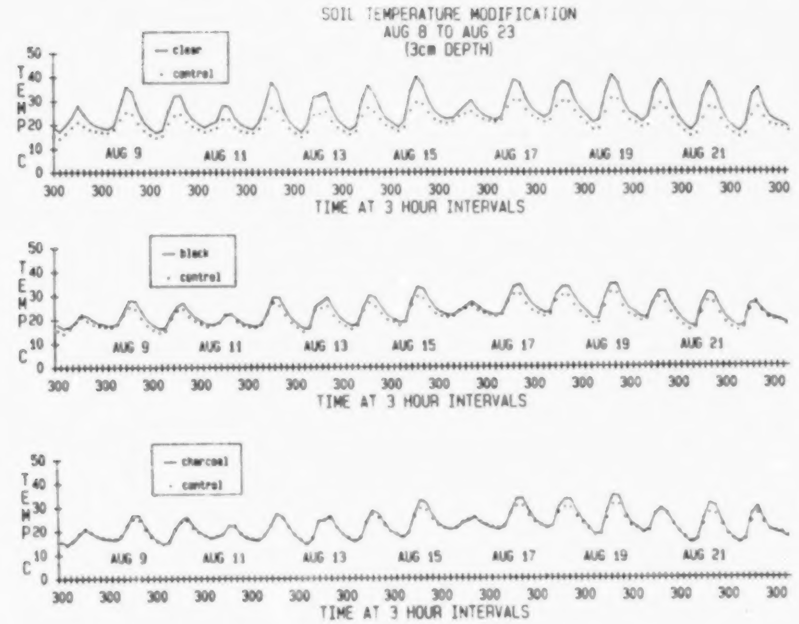


FIGURE 1: Comparison of soil temperatures for various treatments at 3 cm depth on a sandy loam soil at Hoyt, N.B., 1987.

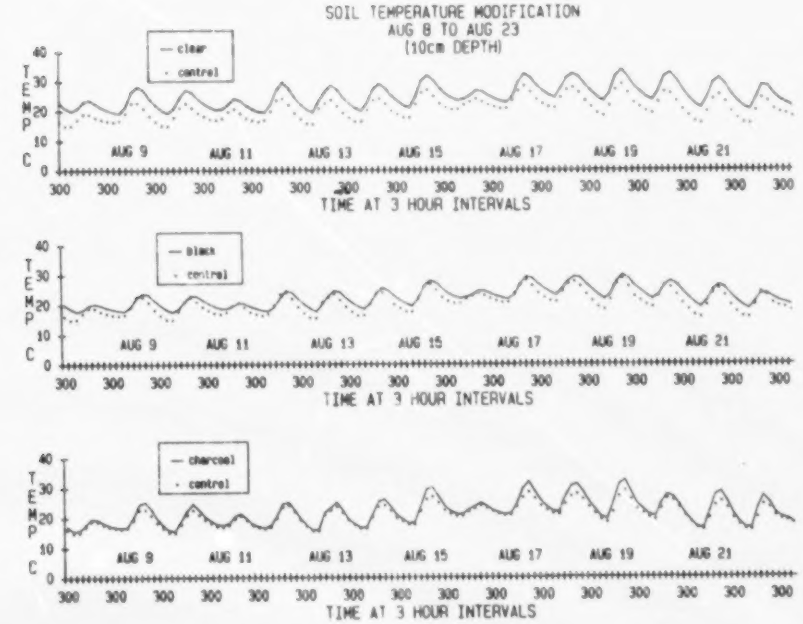


FIGURE 2. Comparison of soil temperatures for various treatments at 10 cm depth on a sandy loam soil at Hoyt, N.B., 1987.

2) Weed control must be evluated and possibly applied. This may be fairly complicated when using a carbon based product.

3. If coal dust proved acceptable, (i.e) effective for darkening the soil and non-toxic, its cost would be approximately $7/acre.

4. The effects of the carbon must be tested on crops to evaluate the response in germination, growth, earliness and yield.

The author would like to thank Campbell Forbes, Rekha Nigum, and Bev Bamford for their assistance with the field trial.

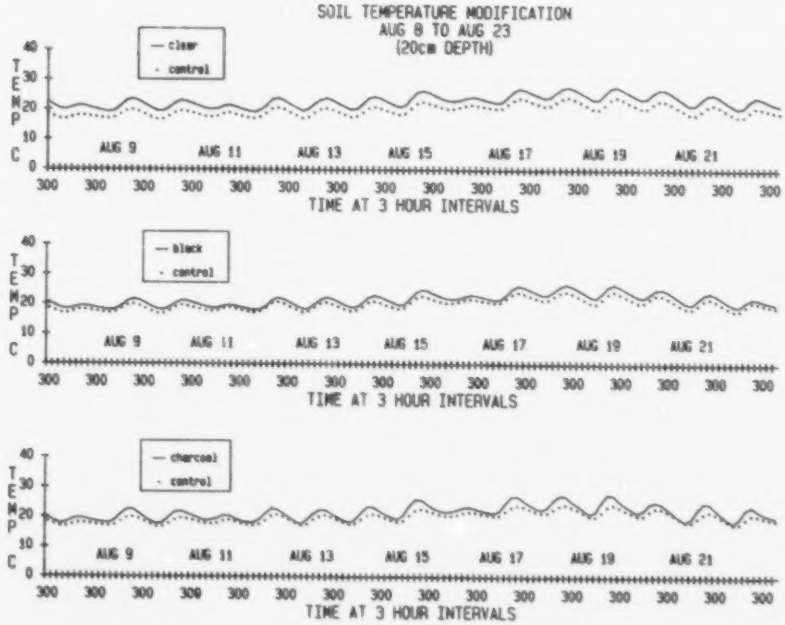


FIGURE 3. Comparison of soil temperatures for various treatments at 20 cm depth on a sandy loam soil at Hoyt, N.B. 1987.

RESPONSE OF PEPPER TO WINDBREAKS

George Read

Abstract: *On a replicated treat at the Hoyt Provincial Horticultural Nursery, the effects of a windbreak on pepper yields were evaluated. The first two harvest dates produced significantly different results with the windbreak peppers outyielding the open treatments substantially. By the third harvest date, no statistically significant differences were measured.*

RÉACTIONS DES POIVRONS AUX BRISE-VENT

Résumé : *Au Centre horticole provincial de Hoyt, on a évalué les effets d'un brise-vent sur le rendement des poivrons. Lors des deux premières dates de récolte, on a pu constater des résultats significativement différents dans les zones mises à l'abri du vent et les zones non protégées; les premières obtenant des rendements substantiellement supérieurs. À la troisième date de récolte, aucune différence significative n'a été constatée.*

INTRODUCTION: Previous work on windbreaks (Read 1985) resulted in appreciable gains in vegetable yields due to protection from the wind. Many studies have evaluated crop yields in response to shelter but results vary from year to year. This imput may be as a result of climatic variation, varietal differences and their response to stress, and even experimental design. Many claims have been made to explain the response of crops to windbreaks. Reduced moisture stress is often cited, however even irrigated trials as was the case in this experiment have still produced large yield differences between the sheltered and open plots. Higher temperatures and earlier maturity as a result are often claimed under the influence of reduced wind as is the benefits of reduced mechanical damage.

METHODS: Three replications of peppers were used to evaluate the response of two treatments, the open or control treatment and a sheltered or windbreak protected treatment. The six plots were irrigated to reduce moisture stress on the sandy loam soils at Hoyt, New Brunswick. The month of July and August were well below normal rainfall for this year and irrigation was frequent.

The third replication of the trial experienced problems with the irrigation system and was excluded from the analysis.

Anemometers were located in the open and behind one of the windbreaks during the course of the trial. The windbreaks consisted of a black 55% open polyethelene netting supported by T-rail posts. The fences were 1 m high by 10 m long. The peppers were transplanted on May 25th and harvested on August 10, 13 and 17.

RESULTS AND DISCUSSION: The windbreaks were located on the prevailing windward side of the trial plots. As is illustrated in Figure 2, the direction of the wind varies considerably throughout the season. Overall, there was on average a 22% reduction in the windspeed behind the polyethelene fences. The fifty-five percent porosity was chosen to give a good combination of wind reduction and effective distance on the leeward side of the fence. The same plants were harvested each week from subplots located behind the windbreak and in the open. The percent increase in yield was very high under the influence of shelter compared to the open on the first two harvest dates. With only two replicates, the results were still significant at the 5% level on August 10th and at the 2% level on August 13th. No differences were detected that were statistically significant after that date (see Table 1).

Table 1. A Comparison of Pepper Yields Under the Influence of a Temporary Windbreak.

Harvest Date	Control (grams)	Windbreak (grams)
August 10	342	119
August 13	839.2	54
August 17	362.7	338.8

* significant at 6% level
** significant at 2% level

This response is highly unlikely to be related to moisture stress as the plots were irrigated equally. The much greater yields from sheltered plots suggests that earlier maturity was reached on these plots than on those in the open.

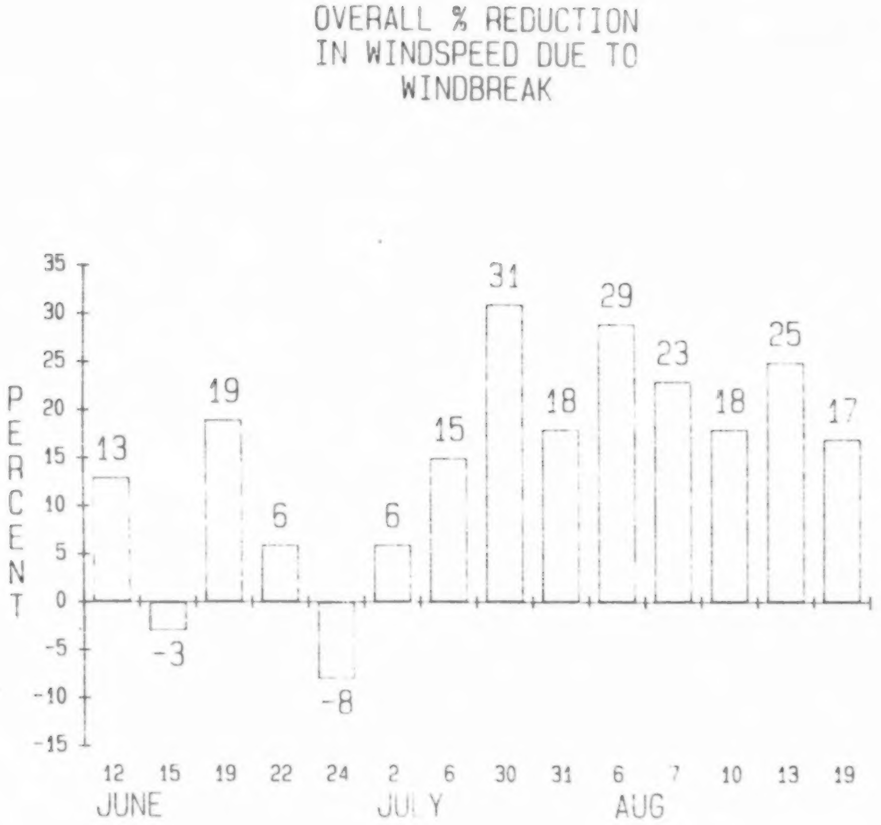


FIGURE 1. **Weekly windspeed behind a windbreak expressed as a percent of value in the open.**

The results from this trial suggest that windbreaks can effectively increase yields of early harvests compared to open areas.

The costs of polyethene windbreaks are approximately $.12/sq. ft. and have a life expectancy of seven years. This expense has to be considered against the overall profits of having earlier peppers ready for sale.

The author would like to thank Rehka Nigum, Bev Bamford and Campbell Forbes for their dedicated work in establishing, maintaining and harvesting the plots.

THE EFFECTS OF SOIL DARKENING ON CUCUMBER YIELD

George Read

Abstract: *A sprayed on mixture of charcoal and water was applied to cucumbers at the Hoyt Horticultural Center in the summer of 1987. The project was initiated to investigate the effects on germination, earliness and yields of cucumbers. The darkened treatment had 38% yield increase over the control plots after six separate harvest dates. The first four harvest dates (3 of which showed significance) produced yields ranging from 80-100% above the control plots. The reason for this remarkable response is not clear but is thought to be primarily one of warmer growing conditions both above and below the soil surface. Further evaluations are planned.*

EFFETS DU FONÇAGE DU SOL
SUR LE RENDEMENT DES CONCOMBRES

Résumé *: Un mélange de charbon et d'eau a été pulvérisé sur les concombres au Centre horticole de Hoyt à l'été de 1987. Le projet avait été lancé afin de chercher à connaitre les effets de ce traitement sur la germination, la précocité et le rendement des concombres. Les zones traitées ont connu une augmentation de rendement de 38 % par rapport aux parcelles témoins, et ce, à six dates de récolte distinctes. Aux quatre premières dates de récolte (dont trois étaient significatives), on a obtenu des rendements de 80 % à 100 % supérieurs à ceux des parcelles témoins. La raison de ces résultats remarquables n'est pas claire, mais on croit que ce rendement est principalement attribuable à des conditions de croissance plus chaudes à la fois au-dessus et au-dessous de la surface du sol. De nouvelles évaluations sont prévues.*

INTRODUCTION: The use of soil surface plastic mulches, row covers and plastic mulches has provided New Brunswick Horticultural producers with earlier crops, better yields and better prices. To further reduce the cost of production and to find an economical alternative for large field crops, a trial was initiated to determine the effects of soil darkening on crop production.

The application of a spray mulch such as carbon ie (charcoal or coal dust) would provide a number of advantages over plastic mulch if it was acceptable at growing and producing earlier crops.

1) Ease of application
2) Cost
3) Clean-up at the end of season

MATERIALS AND METHODS: The spray charcoal treatment was replicated four times on field cucumbers (c.v. marketmore) during the summer of 1987 at the Hoyt Horticultural Nursery. The soil is a very well drained sandy loam.

The treatment was applied after seeding and was re-established periodically after rain or irrigation removed the blackened surface.

Yields were harvested on Aug. 4th, Aug. 6th, Aug. 13th, Aug. 19th, Aug. 24th and Aug. 27. The number of fruit and weight were recorded.

RESULTS AND DISCUSSIONS: The results of the weight and number of fruit are presented for each harvest date in Figure 1 and in Tables 1 and 2. The large increase in yield from the darkened soil at the first harvest date was thought to be the result of being earlier than the control treatment. However, this yield response in both size and number of fruits continued throughout the two-week harvest interval and only evened out over the last two harvest dates. The estimated cost of the charcoal was about $30 per acre and would be much cheaper if a substitute like coal dust (if acceptable) was used (approximately $7/acre).

Table 1: Yield Response of Cucumbers (grams) to Soil Darkening Application.

Date of Harvest	Control	Darkened Soil
August 4	3965	8819*
August 6	1615	3740*
August 13	5669	8748
August 19	5527	10755**
August 24	11871	10263
August 27	9210	9268

* significant at .10% level
** significant at .05% level.

The reasons for the large yield response are speculative. A trial conducted in an adjacant plot where soil temperatures were measured at 3, 10 and 20 cm revealed that the charcoal increased soil temperatures by 2°C. It is also speculated that the air temperatures around the canopy would be higher until the canopy filled-in, and prevented solar radiation from directly striking the soil surface.

Table 2: Yield Response of Cucumber (# of Fruit) to Soil Darkening Application.

Date of Harvest	Control	Darkened Soil
August 4	17	44
August 6	6	21
August 13	20	30
August 19	20	38
August 24	52	43
August 27	51	52

The relationship of the charcoal to soil moisture and fertility needs to be investigated as well.

The very thin layer of charcoal would wash away in heavy rains. Several additives to the charcoal and water solution have been suggested as a result of the trial and the retention on the soil may be improved at minimimal cost. Provided the charcoal or coal dust presents no toxicity problems, it can easily be incorporate into the soil through tillage. It may be possible to actually improve the soil composition with a beneficial darkening agent. Mixing the soil darkening material with lime may reduce the application costs.

The results of this trial were very encouraging and will be continued. There may be a potential for providing a cost-effective alternative for early maturity and increased crop yields for large field crop acreages such as corn and soybeans.

The author would like to thank Rekha Nigum, Bev Bamford and Campbell Forbes for their assistance with the field trial.

SOIL DARKENING DATA FOR CUCUMBERS

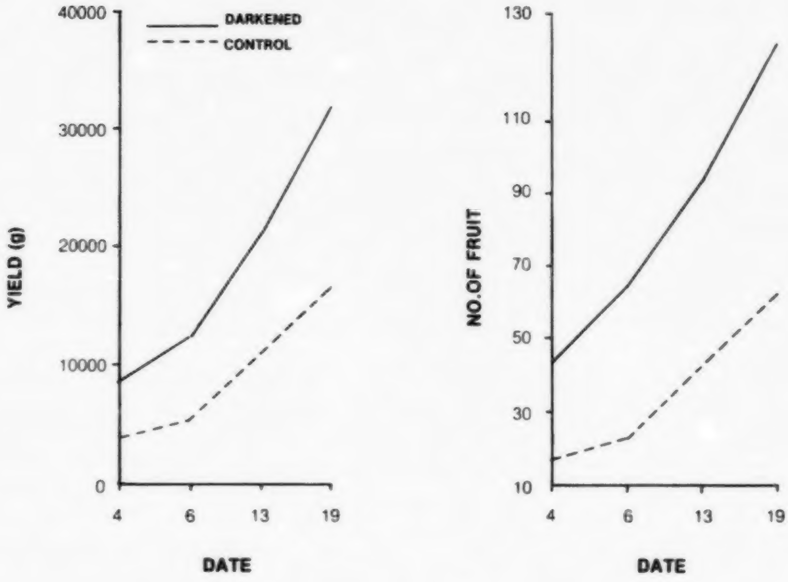


FIGURE 1. A comparison of a soil darkening material with an untreated soil for yield and fruit numbers in cucumbers (c.v. Marketmore)

THE 1987 GROWING SEASON

George Read

Abstract: *The most noticable features of 1987 were the above normal hours of bright sunshine and the widespread drought conditions in July and August. These factors may have contributed to the early maturity of several fruit and vegetable crops, as well as a reduced yield in second cuts of forages, and early potatoes.*

LA SAISON DE CROISSANCE 1987

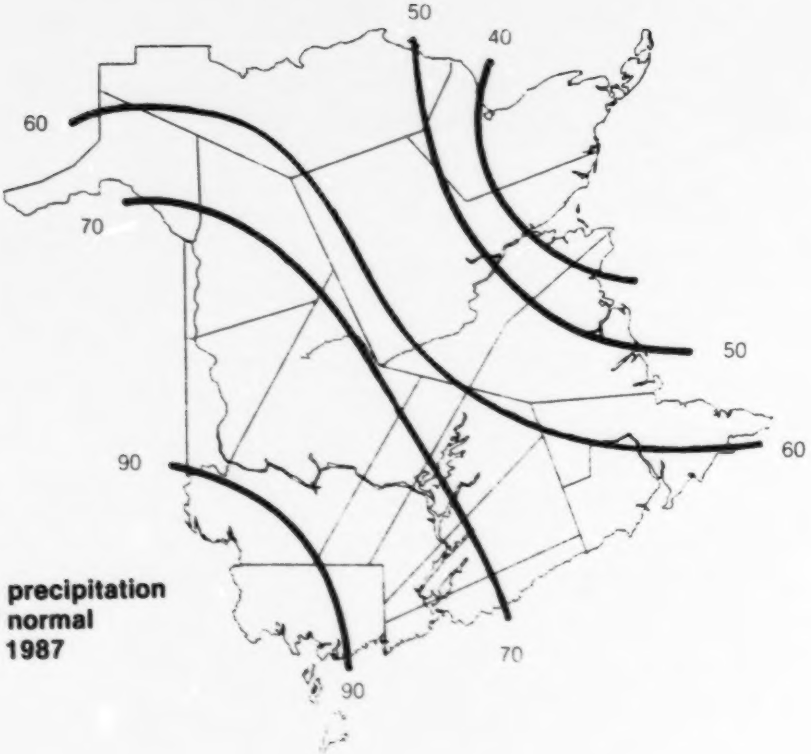
Résumé : *En 1987, le nombre d'heures d'ensoleillement supérieur à la moyenne et les conditions de sécheresse répandues en juillet et en août ont constitué les caractéristiques les plus remarquables de la saison de croissance. Ces facteurs ont pu contribuer à la maturité précoce de plusieurs récoltes de fruits et légumes ainsi qu'au rendement inférieur de la deuxième récolte de fourrage et de la récolte de pommes de terre hâtives.*

INTRODUCTION: Generalizing the weather conditions for an entire province for an entire season does an injustice to the explanation of crop performance. Climate varies tremendously in our proivnce and even at the farm-level with such parameters as frost occurrence, rate of crop development, planting, disease and insect control, and harvesting operations. It is therefore essential to evaluate specific varieties, recommendations and production practices with the most specific weather information possible.

Despite these farm scale influences, the overall performance of crops on a provincial scale can often be correlated with major deviations from normal growing season conditions.

For instance, major droughts or wet periods, extensive frosts or unusually warm or cold seasons can have major consequences on the agricultural economy of the province. With these aforementioned factors recognized, a general summary of the 1987 growing season is presented.

RESULTS AND DISCUSSION: The accompanying maps describe the percent deviation of precipitation and temperature from a long term average (30 years) as interpreted from data collected at Environment Canada climate stations. The precipitation maps were drawn courtesy of the New Brunswick Department of Municipal Affairs and Environment. The heat unit maps were prepared from similar climate station data by the N.B. Department of Agriculture.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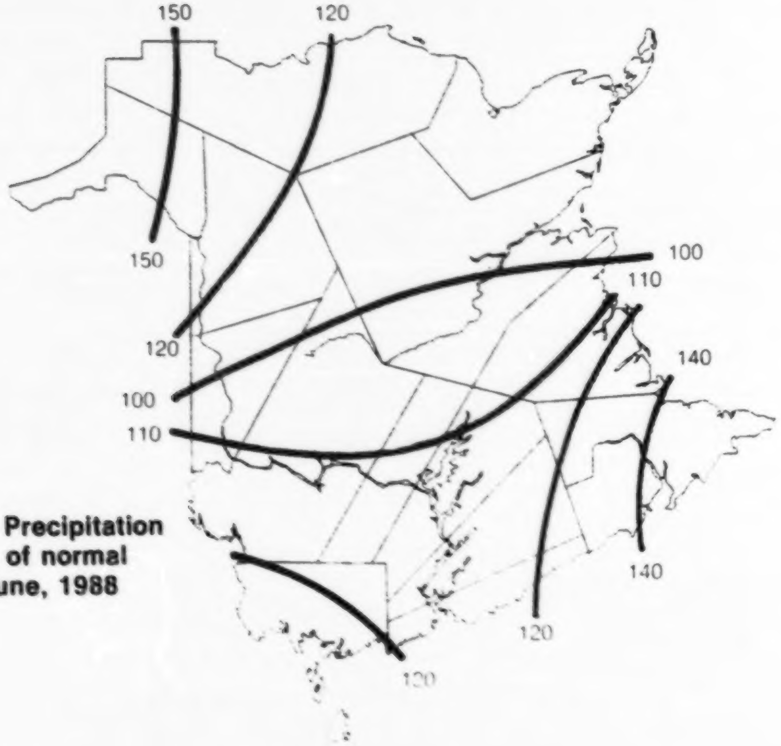
60
70
50
60
90
70
90

Total precipitation
% of normal
May, 1987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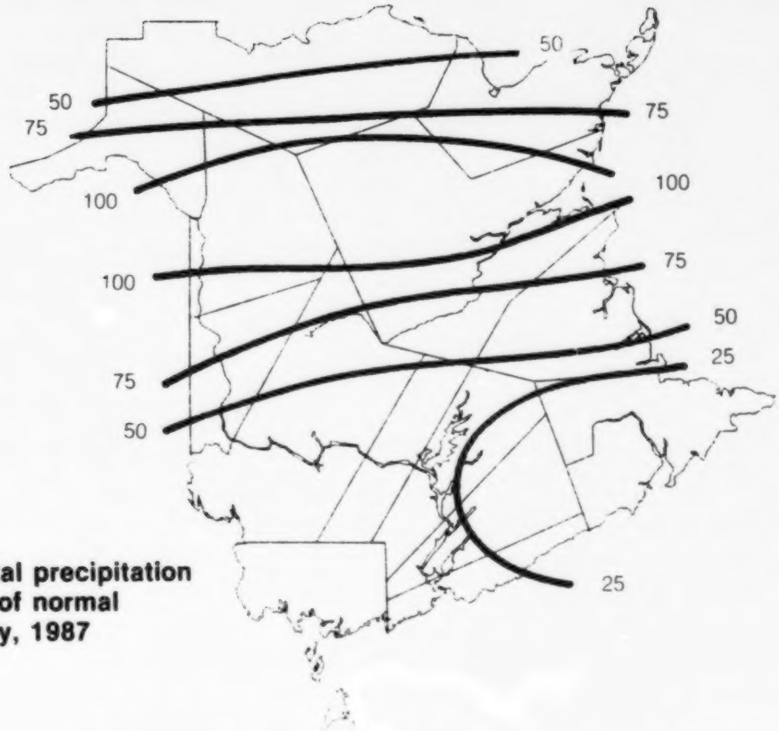
120
150
120
100
110
100
110
140
140
120
120

Total Precipitation
% of normal
June, 1988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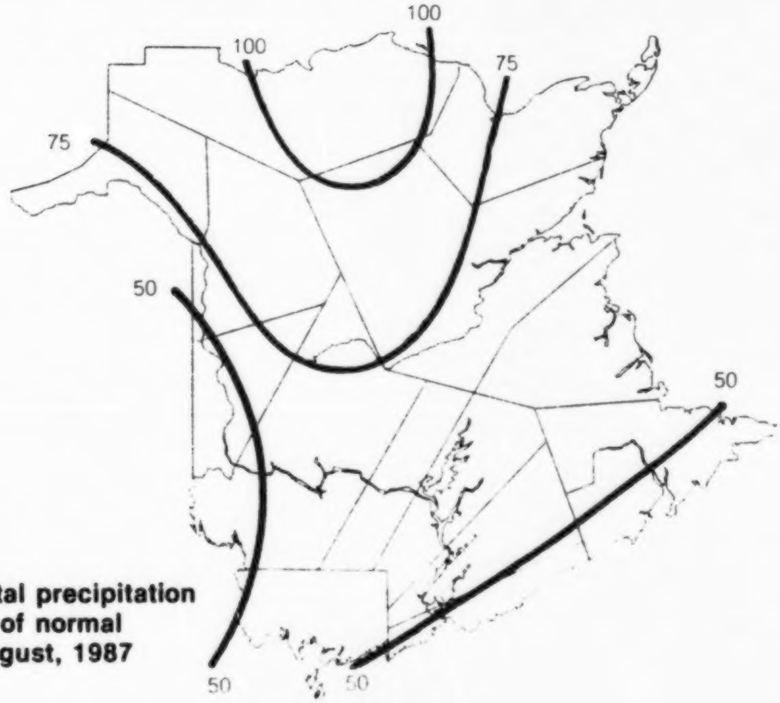
75
75
100
100
100
100
75
75
50
50
75
25
50
25

Total precipitation
% of normal
July, 1987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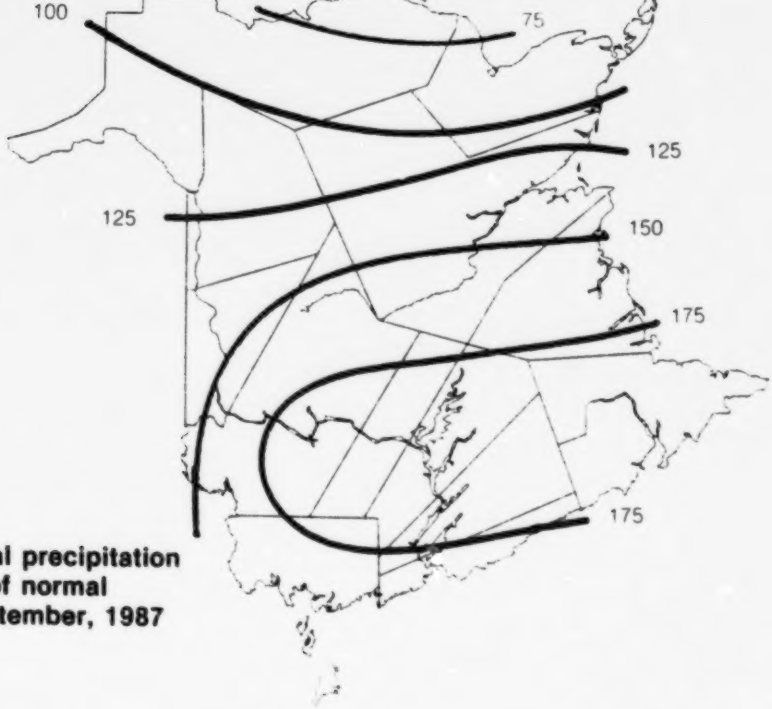
100
75
75
50
50
50
50

Total precipitation
% of normal
August, 1987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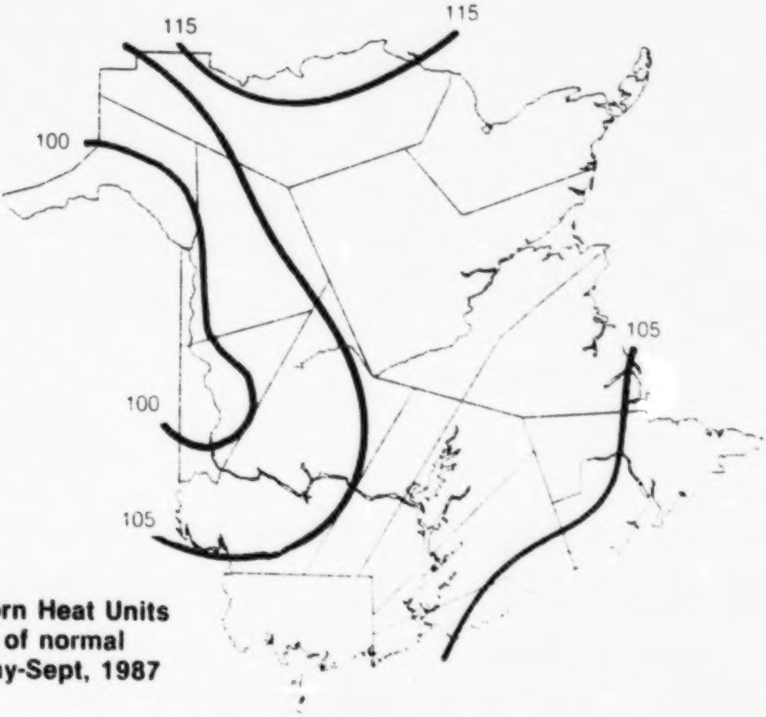
75
125
125
150
175
175

Total precipitation
% of normal
September, 1987


115
115
100
100
105
105

Corn Heat Units
% of normal
May-Sept, 1987